INTRODUCTION

Field projects undertaken by the Geological Survey Branch expanded again in 1987. The base budget continues to be augmented; the Canada/British Columbia Mineral Development Agreement and supplemental funds from the province allowed us to add three more 1:50 000-scale mapping projects, accelerate mineral deposit and industrial mineral studies and cover more area under the Regional Geological Survey program.

In the south (Figure 1), mapping continued near Duncan and was completed in the Hedley area. New projects were begun on the mineral potential of the Rossland volcanics and rocks in the Kokanee Park. In central British Columbia, work continued in the Bridge River area and adjacent areas to the north, and near Quesnel; a new project was initiated near Manson Creek. In the north, crews continued work near Whitesail Lake, in the Babine Range, and north of Cassiar; a new project was started in the Tutshi Lake area.

SOUTHERN BRITISH COLUMBIA

On Vancouver Island, Nick Massey and Steve Friday extended mapping begun last year, completing the Cowichan and most of the Duncan sheets. The project is resolving stratigraphic and structural problems in the Cowichan uplift. The uplift is cored by rocks of the Paleozoic Sicker Group, which hosts volcanogenic massive sulphides such as the Lara and Mount Sicker (Lenora-Tyee) deposits. The older volcanogenic-sedimentary rocks are overlain by Mesozoic volcanic and sedimentary rocks and cut by Mesozoic and Tertiary granitic bodies. The work has shown that Sicker rocks in the area cannot be directly correlated with the Buttle Lake uplift, which hosts the Westmin deposits, or other areas cored by Sicker Group rocks. Stratigraphic nomenclature in the uplift is being revised, and it appears that a major unconformity occurs within the Sicker in the Cowichan Lake area. Interpretation is complicated by lateral facies changes and thrust faults; locally the thrusting involved sedimentary rocks of the Cretaceous Nanaimo Group. The Sicker Group continues to offer exciting potential for polymetallic massive sulphide deposits, as well as auriferous jaspers and gold-bearing quartz-ankerite veins along shears, like those at the Debbie deposit. The area also has potential for industrial minerals, such as limestone and rhodonite. In rocks of the Bonanza Group, there is potential for porphyry copper mineralization, and possibly massive sulphides in marine lower Bonanza rocks. Skarn mineralization may occur in limy rocks adjacent to Jurassic Island Intrusions.

Fieldwork was completed near Hedley, the site of British Columbia’s newest gold producer – the Nickel Plate mine. The focus of this study by Gerry Ray and Garret Dawson is skarn-related gold mineralization. This season the work was extended northeastward to the Oka property, west of Pechland, where a roof pendant of Nicola Group metasedimentary rocks and younger dioritic intrusions hosts gold-bearing skarn mineralization. Near Hedley, the structurally and stratigraphically controlled skarn mineralization is related to diorite intrusions that are localized at the edge of the Nicola sedimentary basin. Tungsten-skarl mineralization on Mount Riordan and mixed gold-tungsten skarns at the French and Goodhope mines suggest zoning in the Hedley Camp from gold-rich to tungsten-rich skarns. This interpretation suggests that areas peripheral to other tungsten skarns hosted by island arc volcanic and sedimentary rocks should be prospected for gold mineralization. The Hedley area may also have potential for mesothermal gold quartz veins and porphyry copper-gold deposits of the Copper Mountain type.

A new project initiated in the Nelson area by Trygve Hoy and Kathryn Andrew will study the structural and stratigraphic controls of gold and silver mineralization in rocks of the Jurassic Rossland Group. The first phase of the project mapped a section through the Ymir and Elise formations into the overlying Hall Formation; the work successfully determined internal stratigraphy within the largely volcanic Elise Formation. Recently, roof pendants of Rossland volcanics have been recognized within the Nelson batholith. At Tillicum Mountain a skarn hosts gold mineralization and, near Silverton, a breccia pipe hosts the Willa copper-gold deposit and quartz veins carry gold mineralization. Zircon ages show that dacite porphyry at Willa is Early Jurassic, the same age as the Rossland volcanics. Other deposit types include molybdenum-tungsten in porphyritic quartz monzonites intrusive into Rossland volcanics, stratabound gold-copper mineralization in altered andesitic pyroclastics, and vein copper-gold mineralization similar to that mined in the old Rossland Camp. Other targets could include volcanogenic massive sulphides and perhaps platinum in potassic, mafic Coryell intrusions.

Geological mapping of Kokanee Glacier Provincial Park was undertaken to evaluate its mineral potential. The 2-year study, undertaken by Derek Brown and Jim Logan, represents the Geological Survey Branch’s contribution to the Kokanee Park master plan. The park area is underlain predominantly by the Middle Jurassic, potash-feldspar mega-crystic Nelson batholith, which hosts narrow, high-grade silver-lead-zinc quartz veins, some of which carry gold. Within the park, there is potential only for mesothermal quartz veins. Past production was from low-tonnage, high-grade mesothermal veins (less than 10 000 tonnes). West of the park, a roof pendant of early Jurassic Rossland volcanics hosts the Willa gold-copper-silver breccia pipe deposit. In the park, roof pendants consist of pelitic and psammitic rocks that are probably correlative with the Siocan Group.

PREFACE

1987 PROJECTS OF THE GEOLOGICAL SURVEY BRANCH

By W. J. McMillan
In the Bridge River camp, Neil Church and Bob Gaba finished mapping the east half of the Bralorne sheet (92J/15) and extended coverage to the north and south from last year's work. The study will re-evaluate the geology and controls of gold mineralization in the old but very productive Bridge River camp. Bralorne-type gabbro diorite intrusions were apparently emplaced along old deep-seated faults. The faults also acted as conduits for ultramafic bodies and hydrothermal fluids that produced the Bralorne and Pioneer orebodies as well as other prospects throughout the camp. Other ore controls are relatively young subsidiary fractures feathering off large northerly trending faults, as on the Reliance claim. The area has potential for other gold deposits of the Bralorne-Pioneer type, gold-antimony veins and tungsten, molybdenum and mercury deposits. The Shulaps and President ultramafic bodies have potential for magnesite, jade, talc, and certain gold targets, like the Elizabeth-Yalakom prospect.

A project is also in progress nearby in the Taseko-Bridge River area. Regional mapping by Keith Glover and Paul Schiarizza continued eastward from the Warner Pass sheet (92O/03), east of Taseko Lakes, onto the Noaxe Creek sheet (92O/02). The area includes Lower Cretaceous sediments and Tertiary volcanic rocks northeast of the Yalakom fault, the area of the Poison Mountain porphyry copper deposit, and Triassic to Upper Cretaceous sedimentary and volcanic rocks southwest of the fault. This work has established relationships between the Taylor Creek and Kingsvale groups that will require redefinition of the Cretaceous stratigraphy of the area. Local areas of carbonate-altered serpentinite that have potential for gold mineralization occur along the trace of the Yalakom fault. This and other northwest-trending strike-slip faults offset the Mesozoic rocks and are locally truncated by or are the focus of Tertiary granitic intrusions of probable Tertiary age. These intrusive rocks are hydrothermally altered in places and host epithermal to mesothermal gold mineralization.

In the Quesnel area, Andre Panteleyev, Mary Anne Bloodgood, Lu Jun and Dave Bailey continued 1:20 000-scale mapping as part of a study of precious metal deposits in the
Quesnel trough. This project has two elements. The first is a study of the controls of lode gold mineralization in the basal Triassic black phyllites, such as those at the Frasergold prospect near Eureka Peak, and higher in the section at the CPW prospect on Spanish Mountain, where mineralization is in mixed sedimentary and volcanic rocks. The second considers the distribution and controls of copper-gold deposits in the central volcanic belt, which hosts deposits like QR, where mineralization occurs in propylitically altered volcanic rocks adjacent to subvolcanic alkalic dioritic intrusions, and Cariboo Bell which is a porphyry copper-gold deposit. The mappers noted some low-temperature alteration patterns indicative of large-scale geothermal flow systems; one silicified fault zone contains significant concentrations of silver, arsenic and antimony.

In the new Manson Lake project, Filippo Ferri and David Melville mapped a complex area with metamorphic rocks of the Wolverine complex of the Omineca Belt on the northeast, and mafic to intermediate volcanic, cherts and related sediments of the Slide Mountain Group of the Intermontane Belt on the southwest. The metamorphic rocks are cut by coarse granitic rocks and pegmatites, the volcanic rocks by granitic rocks of the Germansen batholith. The area has potential for hydrothermal gold deposits in Slide Mountain rocks, porphyry copper-molybdenum deposits related to the Germansen batholith, and rare earths in carbonatites in the Wolverine complex. Talc-altered volcanic and ultramafic rocks along the southwest extension of the Manson fault zone along Manson Lakes valley are being prospected for precious metal mineralization.

Mapping by Larry Diakow and Victor Koyanagi in the Whitesail Lake area covered parts of two 1:50 000 map sheets, 93E/06 and 93E/10. The area is underlain mainly by Jurassic island arc calcalkaline flows and tuffs that are overlain by a Cretaceous succession of subaerial flows, tuffs and epiclastic rocks. The Jurassic volcanic succession is locally separated by a marine tongue of the Smithers Formation into two nearly identical packages of largely maroon volcanics. To the north, the lower Telkwa Formation volcanics have rhyolitic flows that host auriferous base metal-bearing quartz veins at the New Moon property. The fault that thrust a panel of metavolcanic and metaplutonic rocks over Skeena Formation near Lindquist Lake hosts auriferous pyritic quartz veins at the Deer Horn deposit and base metal veins to the west; it is a regional target for mineralization.

In the Babine Range, Don MacIntyre and Patrick Desjardins completed 1:20 000-scale mapping in the south half of sheet 93L/15. The mapping focused on the north part of the range where a thick pile of folded and thrust-faulted, Late Cretaceous to Tertiary volcanic and sedimentary rocks underlies Mount Hyland and Mount Cronin. These rocks are interpreted to be remnants of a Late Cretaceous volcanic centre. The work also documents a complex Tertiary tectonic event that was accompanied by extensive hydrothermal activity. Shear zones with numerous gossans and veins cut the Late Cretaceous volcanics; these were sampled during the mapping program. Known occurrences, such as the Cronin mine, were also visited and sampled.

Dani Alldrick and Jim Britton began a project in the bustling Sulphurets area this summer and Dave Lefebvre mapped south of the Iskut River in the Johnny Mountain area. In the Sulphurets area about 500 square kilometres centred on Brucejack Lake were mapped. The work revised old mapping, discovered previously unmapped intrusions, and established stratigraphic continuity with the Stewart area to the south. The main targets are high-grade gold-silver veins, but copper, lead, zinc, molybdenum, nickel and barite occurrences are also known.

South of the Midway area, JoAnne Nelson and John Bradford mapped sheet 104P/12 as part of the Midway/Cassiar project. The Sylvester allochthon, which underlies much of the area, consists of three major units, two of which show linkages with ancestral North America. Dating of samples collected in 1986 reveals Middle and Late Cretaceous episodes of mineralization; Midway is Late Cretaceous. Mineralization has been found in association with northwest-trending wrench fault systems, particularly within quartz and carbonate breccias in carbonate-host rocks. These are interesting targets for precious metals.

In the Tutshi Lake area, Mitch Mihalyvuk and Jonathan Rouse mapped sheet 104M/15, concentrating on a northwest-trending belt that hosts most of the area's known mineral occurrences. The map area is underlain dominantly by rocks of the Lower Jurassic Laberge Group that are cut by Late Cretaceous granitic bodies. The mapping showed that Upper Triassic Stuhini volcanics are much less abundant than previous work indicated. There is a significant package of previously unrecognized Middle to Late Jurassic volcanics. The Mesozoic rocks lie unconformably over pre-Permian metamorphic rocks and locally a basal conglomerate is developed. Potential exploration targets are precious metal vein deposits, gold-quartz veins like those at the Engineer mine, gold-stibnite veins, auriferous quartz-carbonate zones and gold-rich skarns.

Activity in Industrial Minerals Subsection increased in 1987. Gary White carried out assessments of dimension stone, olivine and feldspar/nepheline syenite resources in the province. Peter Read continued an evaluation of Tertiary basins. The study considers clay, zeolites, pizzolinic rocks, diatomite, germanium, bentonite and other deposits. Stephen Butrenchuk extended his phosphate resource evaluation into northeastern British Columbia. Jennifer Pegg began an evaluation of garnet, kyanite, sillimanite and andalusite resources, which mainly occur in the Omineca and Coast crystalline belts. Office-based compilations of talc, magnetite, sulphur, barite, chrome and peat resource potential will be released as Open File reports in early 1988.

In the southeast, David Grieve completed 1:10 000-scale mapping of the north half of the Elk Valley coalfield. In the northeast, Andrew Legun continued work to evaluate the coal potential of the Geoothing Formation, and Ward Kibby completed 1:50 000-scale compilation and field checks in the Kinuseo area (93L/14 and 15). On Vancouver Island, Candace Kenyon compiled geological data and carried out field checks in the Nanaimo and Comox coal basins.
The Geological Survey Branch also aided 21 post-graduate thesis projects with potential applications to mineral exploration. Progress reports are presented in this volume. The projects range from mineral deposit studies, to mapping, to the origin of ultramafic rocks and include stable isotope and geochemical research projects.

SPECIAL PROJECTS
A special project to examine auriferous skarns throughout the province was begun this summer by Art Ettlinger in cooperation with Gerry Ray. Art studied deposits in the Zebellos, Atlin and Hedley areas, and on Texada and Banks islands. Petrologic, isotopic, whole-rock geochemical and microprobe analyses are planned to try to relate mineral compositions with skarn types and hence mineralization.

Another special project, under Graham Nixon, will study platinum group element abundances and potential in ultramafic rocks in the Cordillera. Detailed work this year was on the Alaskan-type Tulameen complex, located near Princeton, where placer miners have recovered platinum from their operations. Platinum occurrences to the east, in the Franklin Camp, were also examined. Extensive lithogeochemical, geochronological, petrological and mineralogical analyses are planned.

APPLIED GEOCHEMISTRY PROGRAM
The Applied Geochemistry Subsection was involved in a number of baseline geochemical surveys, orientation surveys and research projects in 1987. Paul Matysek and Stephen Day conducted orientation studies in a variety of geological and physiographic environments to determine the characteristics of stream sediment anomalies associated with five typical modes of mineralization on northern Vancouver Island. The 1987 Regional Geochemical Survey (RGS) under the direction of Paul Matysek and John Gravel sampled 35,000 square kilometres of rugged and remote terrain in northwestern British Columbia (104B, F, G, and K). In total, 3276 sites were sampled at a density of one sample per 12 square kilometres. All stream sediments will be analysed for gold and the routine RGS 19-element suite; stream waters will be analysed for uranium, fluorine and pH.

The subsection also provided advice on sampling methods to regional mapping crews, and in cooperation with Dr. W.K. Fletcher of The University of British Columbia, is undertaking a study of the dispersion of platinum and palladium in stream sediments and soils from four geologically distinct platinum occurrences (Tulameen, Giant Nickel, Franklin Camp and Scottie Creek).