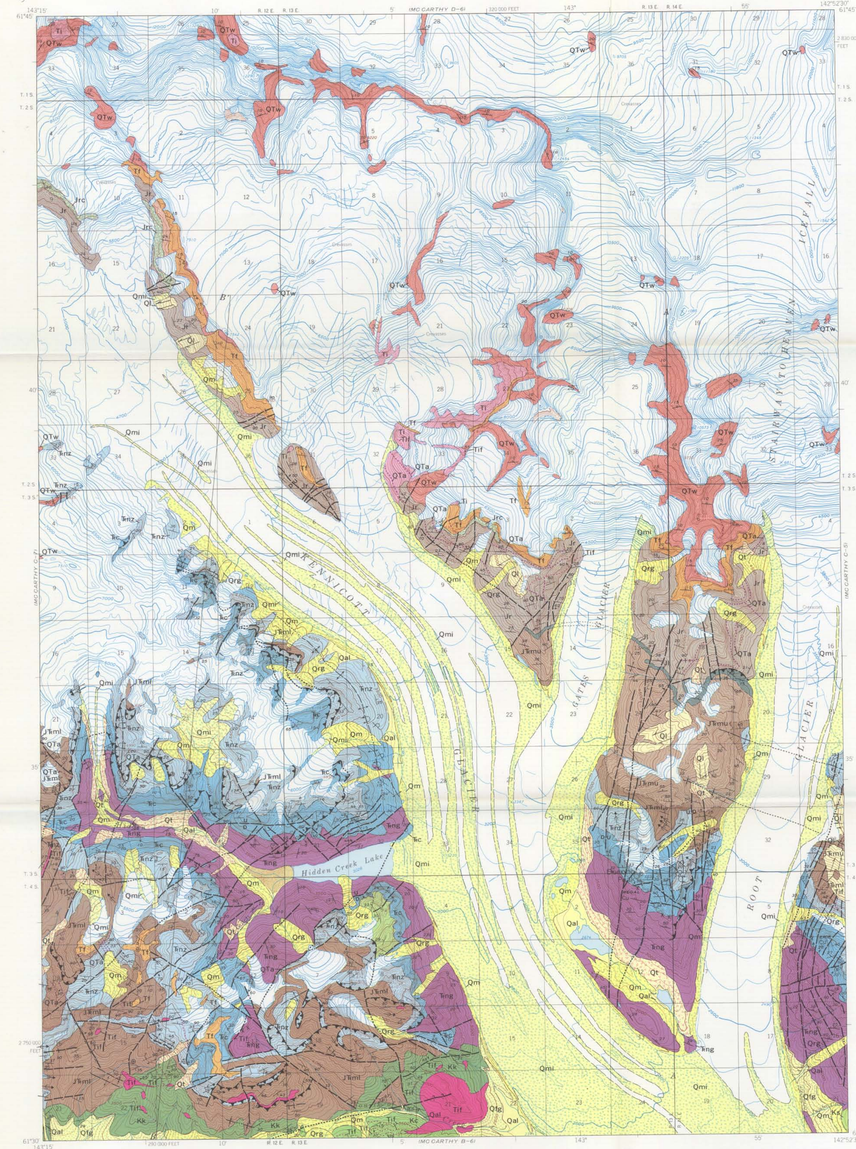
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

GEOLOGIC QUADRANGLE MAP
MCCARTHY C–6 QUADRANGLE, ALASKA
QQ–979

GENERALIZED COLUMNAR SECTION

SYSTEM	SERIES	STAGE	APPROXIMATE DISTANCE FROM BASE OF SECTION (IN FEET)	LITHOLOGY	FORMATION, MEMBER, LENTIL, OR ROCK UNIT MAP UNIT	CHARACTERISTIC MEGAFOSSILS
QUATERNARY					Surficial deposits Includes alluvium, talus, moraines, moraines on ice, landslides, rock glaciers, and fluvioglacial deposits	
					UNCONFORMITY	
			27,000			(Intraformational stratigraphic position not implied) Credit for identifications and age assignments: Cretaceous invertebrates; D. L. Jones, U.S. Geological Survey; Jurassic invertebrates, R. W. Imlay, U.S. Geological Survey; Triassic invertebrates, N. J. Silberling, Stanford University and U.S. Geological Survey
			26,000			
			25,000		Wrangell Lava Subaerial andesitic flows, pyroclastic rocks, and minor vitrophyre	
			24,000			
			23,000		Andesitic dikes and sills	
TERTIARY	? Pliocene ?		22,000			
			21,000		Felsic hypabyssal rocks Dacite and dacite porphyry	
			20,000		Intermediate granitic Chiefly granodiorite rocks	
	? Miocene ?		19,000			
			18,000		Frederika Formation Diverse continental sedimentary rocks including conglomerate, sandstone, siltstone, shale, and rare lignite. In places intercalated with flows of Wrangell Lava	Plant remains
					UNCONFORMITY	
					Top not exposed in C–6 quadrangle	
CRETACEOUS	Lower(?) and Upper Cretaceous				Chititu Formation Mudstone and shale	*Inoceramus* fragments
			17,000		Contact not exposed in C–6 quadrangle	
					Schulze Formation Porcellanite and siliceous siltstone	*Inoceramus* fragments
	Lower Cretaceous	Albian			Base not exposed in C–6 quadrangle Top not exposed in C–6 quadrangle	
					Kennicott Formation Sandstone, siltstone, conglomerate, and shale	*Mojsisovicsites robustus* *Aucellina* Fossil wood and plant debris
					UNCONFORMITY	
JURASSIC	Upper Jurassic	Kimmeridgian	16,000		Conglomerate lentil Cobble and pebble conglomerate	
		?				*Buchia concentrica* (Sowerby) *Buchia rugosa* (Fischer) *Buchia* cf. *B. rugosa* (Fischer) *Lima* sp. *Oxytoma* sp. *Buchia* ? Belemnite undet.
		Oxfordian	15,000		Root Glacier Formation Mudstone, sandstone, siltstone, and shale	
		?	14,000			
	Lower Jurassic	Toarcian			DISCONFORMITY Lubbe Creek Formation Impure spiculitic chert and coquina	*Weyla* sp. *Camptonectes* sp. *Meleagrinella* ? sp.
		Pliensbachian	13,000			"*Entolium*" *semiplicatum* Hyatt *Crucilobiceras* cf. *C. ruinarte* (Hertlein) *Crucilobiceras* cf. *C. filum* (Quenstedt) *Crucilobiceras* ? sp. *Gleniceras* ? sp.
TRIASSIC AND JURASSIC	Upper Triassic(?) and Lower Jurassic	Sinemurian	12,000		Upper member Impure limestone, impure layered chert, and shale	
		?	11,000		McCarthy Formation	
	Upper Triassic and Lower Jurassic(?)	Rhaetian(?) and Hettangian(?)	10,000		Lower member Impure limestone with intercalated carbonaceous shale and subordinate siltstone	*Oxytoma* Plant remains *Halobia* cf. *H. fallax* Mojsisovics *Monotis subcircularis* Gabb "*Chlamys*" sp. A *Juvavites* sp. indet.
		?	9000			
	Upper Triassic	Norian			Nizina Limestone Limestone with thin chert layers and lenses; some nodular chert	*Juvavites* sp. indet. *Juvavites* (*Anatomites*) sp. *Juvavites* aff. *J. sakesbayensis* Mojsisovics *Halobia eastrina* Mojsisovics *Halobia* sp. indet. *Gryphaea* ? sp. Terebratuloid brachiopod *Anatrapezites* sp.
		?	8000			
		Karnian	7000		Chitistone Limestone Limestone, dolomitic limestone, and dolomite; in part very, stratified; local chert nodules	*Gryphaea* ? sp. *Plarunopsis* ? sp.
		?	6000		DISCONFORMITY	
TRIASSIC	Middle and (or) Upper Triassic		5000		Nikolai Greenstone Mainly subaerial basalt flows, generally amygdaloidal	
			4000			
			3000			
			2000			
			1000			
			0		Base not exposed in C–6 quadrangle	The Nikolai Greenstone may be at least 2000 feet thicker in the quadrangle



Base by U.S. Geological Survey, 1966.
10,000-foot grid based on Alaska coordinate system, zone 2

SCALE 1:63 360

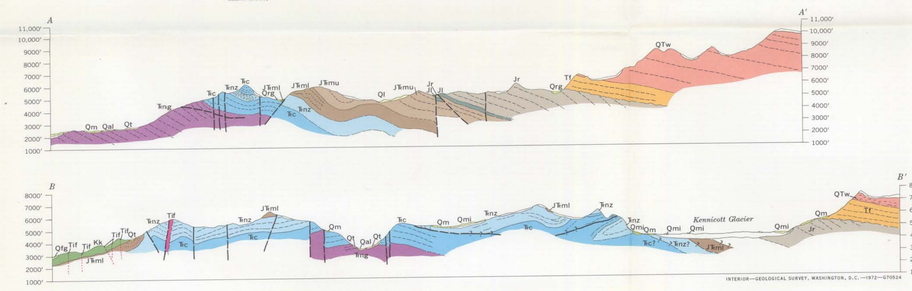
1 ½ 0 1 2 3 MILES
1 .5 0 1 2 3 KILOMETERS

CONTOUR INTERVAL 100 FEET
DATUM IS MEAN SEA LEVEL

APPROXIMATE MEAN DECLINATION, 1972

ALASKA
QUADRANGLE LOCATION

Geology mapped by E. M. MacKevett, Jr., 1963, 1967; D. P. Whistler and J. H. Stout, 1963



INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1972—G70524

GEOLOGIC MAP OF THE MCCARTHY C–6 QUADRANGLE, ALASKA

By
E. M. MacKevett, Jr.
1972

EXPLANATION

(Publications that contain more detailed descriptions of the map units and are largely based on investigations in nearby quadrangles are listed under "References cited." Terminology of noncarbonate clastic rocks follows Williams, Turner, and Gilbert (1954), and that of carbonate rocks follows Dunham (1962))

Qal | Qt | Ql | Qrg | Qm | Qmi | Qfg

Surficial deposits
(age equivalence not implied)

Qal, *alluvium*
Qt, *talus*
Ql, *landslides; arrows indicate apparent direction of movement*
Qrg, *rock glaciers*
Qm, *moraines*
Qmi, *moraines on ice*
Qfg, *fluvioglacial deposits, mainly sandstone, siltstone, and conglomerate*

UNCONFORMITY

QTw | Tf | Tf

Wrangell Lava and Frederika Formation
QTw, *Wrangell Lava; subaerial andesitic flows, pyroclastic rocks, and minor vitrophyre*
Tf, *Frederika Formation; diverse continental sedimentary rocks including conglomerate, sandstone, siltstone, shale, and lignite*

QTa | Tif | Ti

Intrusive rocks
QTa, *andesitic dikes and sills*
Tif, *felsic hypabyssal rocks; dacite and dacite porphyry*
Ti, *intermediate granitic rocks; chiefly granodiorite with local hypabyssal phases*

QUATERNARY
TERTIARY

UNCONFORMITY

Kc | Ks

Chititu Formation
Dominantly mudstone and shale

Schulze Formation
Porcellanite and siliceous siltstone

Kk

Kennicott Formation
Sandstone and siltstone, subordinate conglomerate and shale

Lower(?) and Upper Cretaceous
Lower Cretaceous
CRETACEOUS

UNCONFORMITY

Jr | Jrc

Root Glacier Formation
Jr, mudstone, sandstone, siltstone, and shale
Jrc, conglomerate lentil; cobble and pebble conglomerate

DISCONFORMITY

Jl

Lubbe Creek Formation
Impure spiculitic chert and coquina

Upper Jurassic
Lower Jurassic
JURASSIC

JTmu

McCarthy Formation
JTmu, upper member; impure limestone, impure chert and shale
JTml, lower member; impure limestone with intercalated carbonaceous shale and minor siltstone

Upper Triassic(?) and Lower Jurassic
TRIASSIC AND JURASSIC

Tinz

Nizina Limestone
Limestone, generally containg chert layers and lenses and some nodular and coalescing chert

Tic

Chitistone Limestone
Limestone, dolomitic limestone, dolomite, and minor nodular chert

DISCONFORMITY

Upper Triassic
Middle and (or) Upper Triassic
TRIASSIC

Tmg

Nikolai Greenstone
Basalt, typically altered

Contact, showing dip
Dashed where approximately located; short dashed where gradational; dotted where concealed

U / D — Fault, approximately located
Showing dip. Dotted where concealed. U, upthrown side; D, downthrown side

Vertical fault, approximately located
Dotted where concealed

Probable fault

QTa — Fault intruded by dike, approximately located

Thrust fault, showing dip
Approximately located. Dotted where concealed; sawteeth on upper plate

QTa — Thrust fault intruded by dike, approximately located

Anticline
Showing approximate trace of axial surface and, in places, dotted where concealed

Overturned anticline, approximately located
Showing direction of dip of limbs and trace of axial surface; dotted where concealed

Normal / Overturned
Minor anticline, showing direction of plunge

Syncline
Showing approximate trace of axial surface. Dotted where concealed

Overturned syncline, approximately located
Showing trace of axial surface and direction of dip of limbs. Dotted where concealed

Normal / Overturned
Minor syncline, showing direction of plunge

Inclined / Horizontal / Overturned
Strike and dip of beds

Strike and dip of lava flows

Copper mine or prospect, showing name if known

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

ALLUVIUM—Unconsolidated detritus with a wide size range, chiefly silt and sand; deposited mainly along streams; locally crudely stratified

TALUS— Generally forms thin veneers on flanks of oversteepened valleys; composed of unconsolidated angular fragments and slabs of locally derived fresh rock

LANDSLIDES— Jumbled mixtures of rock and regolith characterized by hummocky surfaces, irregular configurations, and broad size range of constituent material

ROCK GLACIERS— Crudely lobate, sinuous, or spatulate deposits of disarrayed angular, slabby, or blocky boulders of local derivation; locally monolithologic; partly cemented by ice. See MacKevett (1970b)

MORAINES— Mainly end moraines of alpine glaciers and lateral moraines of large valley glaciers; typically hummocky surfaces; composed of jumbled masses of angular and subangular boulders with broad size ranges and diverse lithologies. See MacKevett (1970b)

MORAINES ON ICE—Mainly supraglacial lateral, medial, and end moraines on the Kennicott Glacier and its tributary glaciers; physically similar to moraines (Qrm) but underlain by ice

FLUVIOGLACIAL DEPOSITS— Poorly consolidated sandstone, siltstone, and conglomerate; generally in buff to light-brown beds that are as much as 12 feet thick and easily eroded; locally well stratified; clasts in the coarser rocks are dominantly subangular or angular lithic varieties; those in the finer grained rocks are mainly subangular quartz and plagioclase. See MacKevett (1970c)

INTRUSIVE ROCKS

ANDESITIC DIKES AND SILLS—1- to 20-foot-thick resistant dikes and sills of andesite with subordinate dacite; generally greenish gray where fresh and brown where weathered; slightly to moderately porphyritic with plagioclase phenocrysts as much as 1.5 mm long in fine-grained intersertal or intergranular groundmass; contains plagioclase, less abundant augite, and minor to trace amounts of quartz, biotite, sphene, magnetite, pyrite, and ilmenite, and locally abundant alteration products including quartz, calcite, chlorite, epidote, leucoxene, hematite, and clay minerals. See MacKevett (1970a, b)

FELSIC HYPABYSSAL ROCKS—Dacite and dacite porphyry that form dikes and sills 1–50 feet thick and a few small stocks; conspicuously light-colored rocks that crop out boldly and locally form sharp ridges; in places erodes to aggregates of small angular chips; rarely contains small inclusions of intruded host rocks; characteristically porphyritic and strongly altered; contains abundant plagioclase phenocrysts set in extremely fine-grained groundmass whose primary intersertal or felty texture is partly obliterated by alteration products; most phenocrysts 0.5 to 3 mm long, generally corroded and altered; other phenocrysts include minor hornblende and biotite; the groundmass contains plagioclase microlites, quartz, subordinate K-feldspar, rare apatite, opaque minerals, sphene, zircon, and an array of alteration products including illite, other clay minerals, sericite, calcite, hematite, leucoxene, limonite, chlorite, and dolomite; some of the dacitic rocks contain disseminated pyrite. See MacKevett (1970a, b, c)

INTERMEDIATE GRANITIC ROCKS—Granodiorite with local hypabyssal phases; forms small epizonal stocks with moderately rugged outcrops that are locally mantled by rubble; typically fine grained and hypidiomorphic-granular in texture; composed of plagioclase (andesine), less abundant quartz, K-feldspar, hornblende, biotite, and traces of sphene, apatite, magnetite, and ilmenite; sparsely distributed alteration products including chlorite and clay minerals; the uncommon hypabyssal phases differ from the granodiorite texturally by being porphyritic with andesine and a few corroded augite phenocrysts set in a fine-grained intergranular groundmass, and mineralogically by containing augite and traces of epidote and by lacking biotite and hornblende. See MacKevett (1970b, c)

WRANGELL LAVA— Subaerial andesitic flows, pyroclastic rocks, and minor vitrophyre; commonly light to dark gray where fresh; diverse shades of brown where weathered; generally forms bold outcrops; most flows between 2 and 15 feet thick; the vitrophyre forms columnar-jointed lava domes; the flows consist of andesite, basaltic andesite, and minor dacite, typically porphyritic rocks with fine-grained hyalopilitic, intersertal, or, rarely felty groundmass; some flows amygdaloidal or vesicular; many have well-developed flow structure; the phenocrysts include strongly oscillatorily zoned plagioclase (mainly andesine) 1 to 3 mm long and sparsely distributed corroded hypersthene or relict olivine; groundmasses dominantly plagioclase microlites, subordinately clinopyroxene (augite?), hypersthene, glass, quartz, and minor magnetite, ilmenite, apatite, and sphene; the alteration products comprise calcite, chlorite and related ferruginous serpentine minerals, sericite, illite, other clay minerals, and hematite; the pyroclastic rocks consist of crystal or lithic lapilli tuff, agglomerate, and volcanic breccia; the tuff is generally altered and contains numerous fractured and broken clasts, chiefly plagioclase, quartz, and andesitic rock fragments; the agglomerates and volcanic breccias contain coarse andesitic ejecta cemented by lava or by compacted volcanic debris; the vitrophyre contains plagioclase phenocrysts in a glassy groundmass. See MacKevett (1970a, b)

FREDERIKA FORMATION— Diverse continental sedimentary rocks including conglomerate, sandstone, siltstone, shale, and lignite; generally well or moderately indurated; in places intercalated with flows of Wrangell Lava; forms beds that range from less than an inch to more than 30 feet in thickness; marked contrasts in erosional resistance and color, reflecting diverse lithologies; colors range from buff, tan, or light gray, to grayish black; conglomerate generally at base and at several other horizons; the conglomerates are polymict and include pebble, cobble, and boulder conglomerate, commonly with subrounded or subangular clasts in sandstone matrices; lithic clasts in the older conglomerates mainly derived from Root Glacier Formation, those in the younger conglomerates mainly from Wrangell Lava, intrusive rocks, and Frederika Formation; the sandstones range from very fine to very coarse grained types with varied lithologies and textures; their dominant clasts are generally lithic fragments, quartz, and plagioclase; the siltstones and shales are also lithologically diverse and include siliceous, carbonaceous, calcareous, and tuffaceous variants; some dark carbonaceous shales locally grade into thin seams of lignite. See MacKevett (1970a, b)

CHITTU FORMATION— Dominantly mudstone and shale; fissile to massive; locally blocky; erodes to smooth, rounded slopes; generally well indurated; locally finely laminated with hackly fracture; dark greenish gray, dark gray, or grayish black on both fresh and weathered surfaces; composed of widely scattered comminuted clasts embedded in a silica-rich microcrystalline matrix that also contains illite and other clay minerals, sericite, chlorite, and dispersed secondary iron minerals; the clasts include quartz, subordinate plagioclase, chert fragments, biotite, and K-feldspar, and minor zircon and magnetite. See Jones and MacKevett (1969, p. K15–K17); MacKevett (1970c)

SCHULZE FORMATION— Porcellanite and siliceous siltstone; generally highly fractured, thin bedded, or platy; forms subdued outcrops partly masked by abundant rock chips; typically light to medium gray where fresh and light to yellowish brown where weathered; generally finely laminated and rich in microcrystalline silica; clastic constituents are uncommon in the porcellanite and fairly abundant in the siltstone and include quartz, calcite, microfossil tests, chert fragments, glauconite, and opaque minerals; small amounts of clay minerals, sericite, secondary iron oxides, and carbonaceous material are associated with some of the microcrystalline silica. See Jones and MacKevett (1969, p. K13–K15); MacKevett (1970b)

KENNICOTT FORMATION— Sandstone and siltstone, subordinate conglomerate and shale; in thin to massive beds that erode to form moderate slopes; locally abundant fossiliferous limy concretions as much as 3 feet in diameter; mainly medium-gray rocks that weather light to medium brown; the sandstones are dominantly feldspathic wacke consisting of moderately sorted subangular grains 0.02 to 0.2 mm long in a microcrystalline matrix that modally exceeds 10 percent of the rock's volume; the clastic grains include quartz and plagioclase, less abundant calcite, chlorite, biotite, glauconite, and minor to rare K-feldspar, epidote, zircon, opaque minerals, and apatite; matrix constituents include chlorite, chalcedony, clay minerals, sericite, and dispersed secondary iron minerals; most of the siltstones are finer grained replicas of the wacke; the shales are rich in silica and clay minerals; microfossils abundant in the pelitic rocks; the conglomerates include thin pebble conglomerates near the base of the formation and a poorly indurated massive conglomerate, questionably assigned to the Kennicott, at the top of the formation about 2 miles northeast of the southwest corner of the quadrangle; the conglomerates have a sandstone matrix and subangular to subrounded lithic clasts largely derived from Triassic rocks. See Jones and MacKevett (1969, p. K6–K11); MacKevett (1970b)

ROOT GLACIER FORMATION

MUDSTONE, SANDSTONE, SILTSTONE, AND SHALE—In beds from a few inches to about 4 feet thick; generally forms moderate to subdued outcrops; the pelites generally have splintery fracture and erode to small chips; dark gray, dark greenish gray, or grayish black where fresh; light to medium brown where weathered; rare small discoidal limy concretions; the mudstones are extremely fine grained masses of illite and other clay minerals, chlorite, carbonaceous material, and sericite that enclose scattered small clasts comprising quartz, lithic pellets, plagioclase, calcite, and minor pyrite, hematite, ilmenite, and leucoxene; the sandstone types include graywacke and less abundant lithic arenite; the graywacke contains abundant, poorly sorted subangular clasts between 0.01 and 0.5 mm long in chalcedony-chlorite-clay matrix that modally constitutes more than 20 percent of the rock's volume; the clasts include abundant plagioclase (mainly oligoclase), quartz, and calcite, minor lithic fragments, biotite, and opaque minerals, and rare epidote, zircon, barite, and prehnite; the lithic arenite consists of subangular clasts between 0.01 and 0.3 mm long cemented by clear calcite; its clasts include quartz and plagioclase, some lithic fragments and chlorite, and uncommon K-feldspar, biotite, and opaque minerals; the shale and siltstone are mineralogically similar to the mudstone; the shale is finely laminated and fissile; the siltstone contains more abundant and larger clasts than the mudstone and in places is calcite cemented; intergradations between Root Glacier rocks common; microfossil remnants in many of the pelites. See MacKevett (1969, p. A45–A49, 1970b)

CONGLOMERATE LENTIL— Cobble and pebble conglomerate; thick bedded; forms bold outcrops; generally medium or dark gray and weathers brown; contains well-rounded or subrounded cobbles and pebbles in a sandstone matrix that forms 10–20 percent of the rock; the cobbles and pebbles include limestone and subordinate chert derived from Chitistone and Nizina Limestones, less abundant altered basalt derived from Nikolai Greenstone, and small amounts of quartz and granitic rocks. See MacKevett (1969, p. A45–A48; 1970b)

LUBBE CREEK FORMATION— Impure spiculitic chert and coquina; in beds ½–2 feet thick that form rugged outcrops; medium gray; weathers brown or dark yellowish brown. The impure chert contains a chalcedony-rich matrix that encloses fairly abundant microfossil tests, spicules, calcite, quartz, and chlorite, with subordinate limestone fragments, plagioclase, pyrite, and leucoxene, and rare zircon. The coquina forms a few beds near the top of the formation; it consists mainly of whole and fragmented megafossils and scattered detrital grains cemented by chalcedony. See MacKevett (1969, p. A37–A42; 1970b)

MCCARTHY FORMATION

UPPER MEMBER—Impure limestone, impure chert, and minor shale; beds range from less than an inch to about 4 feet in thickness; locally flaggy to smooth outcrops; cut by calcite veinlets; the impure limestones are very fine grained, medium- to dark-greenish-gray rocks, mainly wackestones, with light- to medium-brown weathered surfaces; some are partly recrystallized; the limestone contains grains of calcite and quartz, microfossil tests and spicules, and subordinate plagioclase, dolomite, and biotite, in a microcrystalline matrix of carbonaceous lime mud and less abundant chalcedony, chlorite, clay minerals, scattered pyrite, and rare apatite; some impure limestones grade into calcareous carbonaceous cherts characterized by abundant quartz or chalcedony and siliceous microfossils; the shales are medium-dark-gray, brown-weathering, finely laminated carbonaceous and calcareous rocks that contain abundant clay minerals and scattered microfossils and opaque minerals, chiefly pyrite. See MacKevett (1970a, b, c)

LOWER MEMBER— Impure limestone with intercalated carbonaceous shale and minor siltstone; the limestone beds are between ½ and 3 feet thick and form bold outcrops; the shale and siltstone are fissile and platy and form subdued outcrops; chert sparsely distributed as lenses or spherical nodules about 2 inches in maximum diameter; rare calcite concretions as much as 2 inches in diameter; some calcite veinlets; the impure limestones are locally recrystallized lime mudstone, wackestone, and rare packstone; subconchoidal to hackly fracture; dark gray or dark greenish gray and weather to shades of brown; the lime mudstone and wackestone have microcrystalline lime mud matrix that generally contains some carbonaceous material, chlorite, and flecks of pyrite; the wackestones and packstones contain abundant detritus including lime mud pellets, bioclasts, and grains of quartz, plagioclase, calcite, and dolomite; the shales and siltstones are calcareous and carbonaceous, dark greenish gray or dark gray where fresh and brown where weathered; they contain very fine grained clasts, including quartz, calcite, fragmented fossils and microfossils, and minor plagioclase and dolomite, in a microcrystalline matrix; their matrix constituents include calcite and carbonaceous material, subordinate chlorite, chalcedony, clay minerals, and opaque minerals (chiefly pyrite) and their alteration products. See MacKevett (1970b, c)

NIZINA LIMESTONE— Limestone that generally contains chert lenses and layers as much as 4 inches thick and some nodular and coalescing chert; most limestone beds are between ½ and 3 feet thick and form rugged outcrops; in places bleached and partly recrystallized; typically hackly fractured lime mudstone and wackestone cut by calcite veinlets; the lime mudstone is very fine grained, dominantly dark greenish gray and weathers light or yellowish brown; it contains lime mud and scattered clasts including lime mud pellets, microfossils, fragmented megafossils, and rare quartz; some lime mudstone is flecked with blebs of limpid calcite or contains traces of opaque minerals or carbonaceous material; the wackestone includes fine-grained bioclastic, micropelletoidal, and carbonaceous varieties that are medium or dark greenish gray and weather brownish or greenish gray; it contains pellets of lime mud, bioclasts, and a few quartz grains in a lime mud matrix that contains local carbonaceous material and scattered opaque minerals, chiefly hematite and pyrite; the chert is dark gray or black except where bleached; it consists of microcrystalline silica with abundant siliceous microfossils and a few scattered rhombs of dolomite. See Armstrong and others, (1970, p. D49–D62)

CHITISTONE LIMESTONE— Limestone, dolomitic limestone, dolomite, and minor chert nodules as much as 6 inches in diameter; ranges from local thin shaly limestone (near base) to massive cliff-forming limestone and dolomite; typically forms extremely rugged outcrops; in places strongly fractured and recemented by numerous calcite veinlets; Chitistone carbonate rocks include lime mudstone, crystalline carbonates, and subordinate wackestone, packstone, and grainstone; the mudstones include limy and dolomitic types and generally contain scattered bioclastic debris; most lime mudstones are dark greenish gray, medium gray, or olive gray where fresh, and buff, yellowish brown, or light gray where weathered; the crystalline carbonates are characterized by fine-grained crystalloblastic mosaics of calcite or dolomite; they range from light to dark greenish gray where fresh and from light yellow brown to light gray where weathered; the wackestone, packstone, and grainstone are medium gray or dark greenish gray where fresh and light yellowish brown where weathered; they contain abundant clasts including pelletal mudstone, oolds, oolites, and fossil fragments; the clasts are embedded in a matrix of lime mud or translucent calcite or are grain supported; some Chitistone rocks contain minuscule amounts of opaque minerals, chiefly hematite and pyrite, and chlorite, chalcedony, and quartz. See Armstrong and others, (1970, p. D49–D62)

NIKOLAI GREENSTONE—Basalt, typically altered; in subaerial flows between 3 and 30 feet thick that form moderately rugged outcrops; dark greenish gray or dark gray where fresh; greenish brown or reddish brown where weathered; generally amygdaloidal and fine grained, rarely medium grained; mainly porphyritic with intergranular or, rarely, felty or subophitic groundmass; the phenocrysts are mainly 1–2 mm long and consist of plagioclase (labradorite) and subordinate clinopyroxene (augite) and relict olivine; primary groundmass minerals are labradorite and augite, less abundant magnetite and ilmenite, and rare sphene; the alteration products include chlorite and related ferruginous serpentine minerals, quartz, clay minerals, epidote, sphene, hematite, leucoxene, calcite, and rare devitrified glass, clinozoisite, sericite, and uralitic hornblende; the amygdules are as much as 1 cm long and consist chiefly of chlorite and related ferruginous serpentine minerals that are locally associated with calcite, and less abundant quartz, pumpellyite, prehnite, and epidote; a few of the flows contain sparsely distributed flecks of sulfides or native copper. See MacKevett (1970a, b, c)

REFERENCES CITED

Armstrong, A. K., MacKevett, E. M., Jr., and Silberling, N. J., 1970, The Chitistone and Nizina Limestones of part of the southern Wrangell Mountains, Alaska—A preliminary report stressing carbonate petrography and depositional environments: U.S. Geol. Survey Prof. Paper 650–D, p. D49–D62.

Dunham, R. J., 1962, Classification of carbonate rocks according to depositional texture, in Classification of carbonate rocks—a symposium: Am. Assoc. Petroleum Geologists Mem. 1, p. 108–121.

Jones, D. L., and MacKevett, E. M., Jr., 1969, Summary of Cretaceous stratigraphy in part of the McCarthy quadrangle, Alaska: U.S. Geol. Survey Bull. 1274–K, 19 p.

MacKevett, E. M., Jr., 1969, Three newly named Jurassic formations in the McCarthy C–5 quadrangle, Alaska: *in* Cohee, G. V., Bates, R. G., and Wright, W. B., Changes in stratigraphic nomenclature by the U.S. Geological Survey, 1967: U.S. Geol. Survey Bull. 1274–A, p. A37–A49.

MacKevett, E. M., Jr., 1970a, Geologic map of the McCarthy C–4 quadrangle, Alaska: U.S. Geol. Survey Geol. Quad. Map GQ–844, scale 1:63,360. In press.

MacKevett, E. M., Jr., 1970b, Stratigraphy and general geology of the McCarthy C–5 quadrangle, Alaska: U.S. Geol. Survey Bull. 1323, 35 p. In press.

MacKevett, E. M., Jr., 1970c, Geology of the McCarthy B–4 quadrangle, Alaska: U.S. Geol. Survey Bull. 1333, 31 p.

Williams, Howel, Turner, F. J., and Gilbert, C. M., 1954, Petrography—an introduction to the study of rocks in thin sections: San Francisco, W. H. Freeman Co., 406 p.

For sale by U.S. Geological Survey, price $1.00