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A review of the regional geology and tectonics of southeastern Alaska

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INTRODUCTION

Southeastern (SE) Alaska, an archipelago also known as the "panhandle" of Alaska, is an approximately 52,000 square mile area of intensely glaciated and heavily forested mountains that rise abruptly from a complex system of deep fiords and inland marine waterways. It is underlain by a complex and heterogeneous assemblage of rocks, and is cut by an intricate network of thrust, normal, and strike-slip faults (Buddington and Chapin, 1929; Gehrels and Berg, 1984).

Rocks in the panhandle record a long and complete geologic history beginning in the Proterozoic, representing every Phanerozoic period, and continuing through into the Holocene. These rocks are herein subdivided into ten tectonic assemblages (figures 1 and 2), five ofwhich are terranes that apparently contain distinct geologic records, and five of which are lithic assemblages that are in depositional, intrusive, or unknown contact with the terranes.

This report begins with a summary of the regional geology of SE Alaska which is derived primarily from the synthesis of Gehrels and Berg (1984) and from more recent studies by ourselves and many others. Next, we discuss the components and characteristics of each of the primary tectonic assemblages that comprise SE Alaska and then discuss constraints and speculations on the relations between the terranes. We then present a general overview ofthe tectonic evolution of SE Alaska.

SUMMARY OF REGIONAL GEOLOGY

Stratified rocks

Pre-Jurassic stratified rocks in SE Alaska constitute a series of northwest-elongate belts that vary in depositional age and in degree of deformation and metamorphism. These belts occur along the east and west flanks of the Coast Mountains batholith (known as the Coast Plutonic Complex in Canada and referred to originally as the Coast Range batholith in Alaska) and on the islands to the west (Fig. 2). Rocks east of the batholith include a relatively narrow belt of Proterozoic(?) or lower Paleozoic(?) schist, gneiss, and marble (Werner, 1977, 1978; Monger and Berg, 1987) and Devonian, Carboniferous, Permian, and Triassic sedimentary and volcanic rocks that extend eastward into the interior of British Columbia. Rocks along the west flank of the batholith include a narrow and poorly known assemblage of moderately to strongly deformed Permian and Triassic metasedimentary and metavolcanic rocks. The most extensive assemblage of pre-Jurassic strata occurs on islands to the west, where a surprisingly complete section of sedimentary and volcanic rocks ranges in age from the latest Proterozoic(?) and Cambrian through the Late Triassic.

Upper Mesozoic strata include Jurassic and Cretaceous graywacke and mafic-intermediate volcanic rocks along both the east and west flanks of the Coast Mountains batholith. Strata along the west flank overlap both belts of pre-Jurassic rocks and grade from relatively nondeformed on the west to high-grade schist and gneiss toward the east. A third assemblage occurs along the west coast of northern SE Alaska and consists of strongly deformed and disrupted Cretaceous graywacke and volcanic rocks. Cenozoic strata are widespread and occur on both sides of the batholith. They range from Paleocene to Holocene in age, with some volcanic rocks erupting as recently as 360 +/- 60 years ago (Elliott and others, 1981).

Within the Coast Mountains batholith, metastratified rocks consist primarily of amphibolite- to granulite-facies schist, gneiss, and marble derived from pre-Tertiary protoliths. Some of these rocks may be correlative with the Proterozoic(?) and lower Paleozoic(?) metamorphic rocks along the eastern flank of the Coast Mountains, some were probably derived from the Cretaceous and older stratified rocks to the east and west, and some protoliths may be unique to the batholith.

Intrusive rocks

Intrusive rocks range in age from Cambrian to middle Tertiary but most are Cretaceous or early Tertiary in age. Paleozoic plutons occur on the islands west of the Coast Mountains and include: (1) small bodies of Cambrian metagranodiorite and metadiorite, (2) Ordovician and Early Silurian calc-alkaline granitoids, (3) Middle Silurian to earliest Devonian trondhjemite and leucodiorite, and (4) Pennsylvanian and Permian(?) syenite and diorite. Triassic plutons include a pyroxene gabbro on Duke Island and a large granodiorite body along the east flank of the Coast Mountains batholith. Jurassic plutons occur in a belt from Baranof Island to the west side of Glacier Bay, on southern Prince of Wales Island, and perhaps in close association with Jurassic and Cretaceous strata along the west flank of the batholith. All of the pre-Cretaceous intrusive rocks, except the Pennsylvanian and Permian(?) syenitic-dioritic plutons and the Jurassic plutons on Baranof and Prince of Wales Islands, appear to be cogenetic with volcanic rocks which occur nearby.

Cretaceous and early Tertiary plutons include: (1) granitoids of Early Cretaceous and early Tertiary age on islands west of the Coast Mountains batholith and along the eastern flank of the batholith, (2) belts of mid-Cretaceous ultramafic bodies and Late Cretaceous granodioritic plutons which occur along the west flank of the batholith, (3) Cretaceous and early Tertiary plutons that are primary constituents of the Coast Mountains batholith, and (4) Oligocene and Miocene granitoids which trend west-northwest across the batholith and belts to the west.

Regional metamorphism and deformation

Several phases of deformation and (or) metamorphism have punctuated the evolution of SE Alaska. The most significant and widespread event occurred during Late Cretaceous and early Tertiary time, when stratified protoliths now in the Coast Mountains batholith were regionally metamorphosed to amphibolite or granulite facies, strongly deformed, and intruded by a variety of plutonic suites. Rocks east of and along the eastern flank of the batholith were metamorphosed originally prior to middle Paleozoic time and uplifted, eroded, and perhaps deformed during the Middle Triassic Tahltanian orogeny (Souther, 1971; Monger, 1977). Rocks along the west flank of the batholith were strongly deformed and metamorphosed primarily during formation of the Coast Mountains batholith in Late Cretaceous and early Tertiary time. Toward the west, these rocks decrease in metamorphic grade and degree of deformation and older events are distinguishable. An unconformity at the base of the Jurassic and Cretaceous section indicates that the Permian and Triassic strata to the east and the Triassic and older strata to the west were uplifted and eroded, and at least locally deformed and metamorphosed, between Late Triassic and Late Jurassic time (Gehrels and Berg, 1984; McClelland and Gehrels, 1987b). West of the belt of Jurassic and Cretaceous strata, Paleozoic rocks record deformational and metamorphic events during Middle Cambrian to Early Ordovician and Middle Silurian to earliest Devonian time, and an uplift and erosional event during the Late Permian(?) and Triassic.

Faults

The most conspicuous structural features in SE Alaska are regional strike-slip fault zones that cut the bedrock into a great jigsaw pattern (Twenhofel and Sainsbury, 1958). On the west, the panhandle is truncated at the North American continental margin by the Queen

Charlotte-Fairweather fault system. Faults of this system are known from geologic mapping, earthquake seismology, and from marine and onshore geophysical studies to be active right-lateral structures with considerable displacement. To the north they splay into a set of complex thrust faults (Plafker, 1987). The second major strike-slip system is the Chatham Strait fault, which offsets rocks as young as middle Tertiary by as much as 150 km (Lathram, 1964; Hudson and others, 1982a). This fault is apparently truncated to the southwest by the Fairweather-Queen Charlotte fault system and connects northward with the Denali fault system. The difference in displacement between the Chatham Strait fault (150 km) and the Denali fault (350 km?: Lanphere, 1978; Nokleberg and others, 1985) is a major unresolved problem. The third major strike-slip system in SE Alaska is the Clarence Strait fault, which coincides with a major topographic lineament but has only approximately 15 km of dextral displacement (Gehrels and others, 1987).

In addition to these strike-slip faults, thrust, low-angle normal, and steep dip-slip faults are significant. The oldest known of these are southwest-vergent thrusts in the southern panhandle which moved during Middle Silurian to earliest Devonian time. They were followed by normal movement on gently dipping faults on southern Prince of Wales Island (Keete Inlet fault of Redman, 1981) probably during Late Permian(?) and Triassic time (Gehrels and Saleeby, 1987a). Southwest-vergent thrust faults have been mapped only locally along the west flank of the Coast Mountains batholith (Berg and others, 1988; Rubin and Saleeby, 1987a, b; Gehrels and McClelland, 1988a; McClelland and Gehrels, 1988) but probably are much more widespread. Such faults along the west coast of British Columbia, just south of the panhandle, regionally juxtaposed high-grade metamorphic rocks southwestward over lower-grade rocks during Late Cretaceous time (Crawford and others, 1987). Faults of similar age and style but steeper orientation have also been recognized along the east flank of the batholith (Berg and others, 1978; Crawford and others, 1987). Soon after movement on these thrust faults, rocks of the batholith were uplifted along high-angle faults, one of which is referred to as the Coast Range megalineament (Brew and Ford, 1978).

TECTONIC ASSEMBLAGES

The rocks of SE Alaska were initially divided into regional geologic belts or assemblages by Buddington and Chapin (1929). Schuchert (1923) noted that rocks in one of these belts record a geologic history which is significantly different from other regions of the northern Cordillera -- this assemblage he referred to as the "Alexandrian embayment" within the Cordilleran Geosyncline. Geosynclinal theory dominated syntheses of southeastern Alaska geology until: (1) J.T. Wilson (1968) recognized that Paleozoic rocks of the panhandle occur outboard of coeval miogeoclinal strata and must therefore have been accreted to North America; (2) Monger and Ross (1971) documented the Tethyan or equatorial affinity of Permian fusulinid faunas inboard of southeastern Alaska; and (3) Berg and others (1972) recognized that the pre-Jurassic rocks of southeastern Alaska belong to several distinct tectonic fragments, "terranes," that have disparate geologic records. The terrane concept was applied in a more comprehensive fashion by Berg and others (1978), wherein they divided all rocks of SE Alaska into (1) fundamentally distinct, fault-bounded tectonic fragments, "tectonostratigraphic terranes," and (2) assemblages that were emplaced into or deposited on more than one terrane and are accordingly interpreted to have formed after adjacent fragments were juxtaposed.

In this report we subdivide the rocks of SE Alaska into 10 tectonic assemblages (figures 1 and 2). Five of these are identified as terranes because they apparently have distinct geologic records. These include the Alexander, Chugach, Stikinia, Taku, and Wrangellia terranes. The other five assemblages consist of metamorphic rocks of unknown tectonic affinity, or of rocks that are known or reasonably interpreted to be in depositional or intrusive contact with the terranes. Such assemblages include: (1) Jurassic and Cretaceous strata of the Gravina belt (part of the Gravina-Nutzotin belt of Berg and others, 1972) along the west flank of the Coast Mountains batholith; (2) metamorphic pendants and screens of unknown tectonic affinity within the batholith; (3) plutonic rocks within the batholith; (4) Early, mid-, and Late Cretaceous, Eocene and Oligocene, and Oligocene and Miocene plutons west of the Coast Mountains batholith; and (5) Tertiary and Quaternary strata that are widespread throughout SE Alaska.

Alexander terrane (Ac and Aa on Fig. 2)

The Alexander terrane comprises a variety of stratified, metamorphic, and plutonic rocks of latest Precambrian(?) to Cambrian through Middle(?) Jurassic age that underlie much of the Alaskan panhandle and continue northward into the Saint Elias Mountains region of British Columbia and Yukon (Berg and others, 1972; Churkin and Eberlein, 1977; Gehrels and Saleeby, 1987a) and then westward into the Wrangell Mountains of Alaska (MacKevett, 1978). Volcaniclastic turbidites, shallow-marine carbonate rocks, and subordinate conglomerate of Silurian age are the most widespread units in the terrane. Pre-Silurian rocks occur primarily in the southern part of SE Alaska, upper Paleozoic rocks occur in relatively restricted areas, and Upper Triassic strata crop out in a fairly narrow belt along the eastern margin of the terrane.

The oldest rocks recognized are arc-type metasedimentary and metavolcanic rocks (Wales Group) that were metamorphosed and deformed during the Middle Cambrian to Early Ordovician Wales orogeny (Gehrels and Saleeby, 1984, 1987a). These rocks form the depositional and intrusive basement to an arc-type volcanic-plutonic-sedimentary complex of Early Ordovician to Early Silurian age which underlies much of the southern part of the terrane. Ordovician chert and argillite on Admiralty Island and marine clastic strata and carbonate rocks in northernmost SE Alaska and the Saint Elias Mountains region are interpreted to have formed in a deep- to shallow-marine basin behind this arc system (Gehrels and Saleeby, 1987a). This phase of arc-type activity ceased with onset of the Middle Silurian to earliest Devonian Klakas orogeny, which is manifest in the southern part of the terrane as: (1) southwest-vergent thrusting; (2) regional metamorphism and deformation in some areas; (3) uplift (locally >5 km) and erosion of the arc complex; and (4) generation of anatectic(?) trondhjemite and leucodiorite bodies.

Upper Paleozoic strata in much of the Alexander terrane consist primarily of shallow-marine carbonate rocks, clastic strata, and subordinate mafic-intermediate volcanic rocks. These strata now occur in restricted erosional remnants but probably were much more widespread originally. The predominance of shallow-marine limestone, the lack of regionally significant unconformities or thick conglomerate in the section, and restriction of volcanic rocks to the Middle and Upper Devonian and the Lower Permian parts of the section suggest that the terrane evolved in a tectonically stable environment compared to the early Paleozoic orogenic and magmatic activity.

Upper Triassic strata overlie the Permian and older rocks on a regional unconformity. In the southern part of the terrane, the section generally consists, from bottom to top, of basal conglomerate and sedimentary breccia, rhyolite and rhyolitic tuff, massive limestone, calcareous argillite, and basaltic-andesitic pillow flows and breccia. Toward the northwest, the amount of rhyolite and conglomerate decreases and the proportion of mafic-intermediate volcanic rocks increases. These strata and their subjacent unconformity are interpreted to have formed in a rift environment based on: (1) the bimodal (basalt-rhyolite) composition of the volcanic rocks; (2) occurrence of the section in a relatively narrow belt along the eastern margin of the terrane; (3) stratigraphic evidence for syndepositional faulting; and (4) evidence for Late

Permian(?) and Triassic uplift and erosion without accompanying deformation and metamorphism (Gehrels and others, 1986).

The youngest component of the terrane is the Bokan Mountain Granite, which is a Middle(?) Jurassic peralkaline ring-dike complex on southern Prince of Wales Island (Thompson and others, 1982; Saint-Andre and others, 1983; Armstrong, 1985). The tectonic significance of this body is as yet unknown.

The Alexander terrane was subdivided by Berg and others (1978) and Monger and Berg (1987) into the Craig, Annette, and Admiralty subterranes based primarily on regional variations in stratigraphy and in degree and age of metamorphism and deformation. Gehrels and others (1987) suggest that the Annette and Craig subterranes should not be differentiated, however, because they: (1) share similar pre-Middle Devonian and Triassic lithic assemblages; (2) record the same early Paleozoic tectonic histories; and (3) both lack upper Paleozoic strata where they are adjacent. We accordingly include rocks of the Annette subterrane with rocks of the Craig subterrane.

Relations between the Admiralty (Aa on Fig. 2) and Craig (Ac on Fig. 2) subterranes are more difficult to assess because rocks of the Admiralty subterrane: (1) have only locally been studied in detail; (2) have yielded few fossils; and (3) are regionally metamorphosed and deformed in most areas. However, studies to date on Kupreanof (Muffler, 1967; Brew and others, 1984; McClelland and Gehrels, 1987a, b) and Admiralty (Lathram and others, 1965) Islands and in the Chilkat Range (Lathram and others, 1959; Brew and others, 1985) support the interpretation that Paleozoic strata of the Admiralty subterrane record a different history from coeval rocks in the rest of the terrane. In general, the Admiralty subterrane consists of Ordovician and Devonian to Triassic basinal clastic strata, mafic-intermediate volcanic rocks, and subordinate limestone (Fig. 1). A Late Devonian and Early Mississippian metamorphic and deformational event has recently been recognized in Admiralty subterrane rocks northwest of Haines (Forbes and others, 1987). The timing of this event and the basinal and volcanic-rich nature of these strata contrast with the history of the Craig subterrane and support their distinction as two subterranes.

The earliest reliable link between the two assemblages occurs in the Permian, when clasts of chert from the Admiralty assemblage were deposited on the Craig subterrane and dolomite of the Pybus Formation was deposited over both assemblages (Muffler, 1967; Berg and others, 1978; Jones and others, 1981). Triassic strata of the two subterranes are apparently correlative. Thus, prior to Permian time, the Admiralty subterrane may have been a basinal, volcanic-rich facies adjacent to a tectonically stable, dominantly shallow-marine facies, or it may have been a distinct tectonic fragment.

The displacement history of the Alexander terrane prior to its Mesozoic accretion is poorly constrained and is a subject of considerable speculation. Apparently reliable constraints on its paleoposition include: (1) Nd-Sr isotopic data which indicate that the terrane comprises juvenile crustal materials and was not in proximity to a large continental landmass prior to Jurassic time (Samson and others, 1987, 1988); (2) paleomagnetic data which suggest that the terrane evolved near the paleoequator from Ordovician through Pennsylvanian time (Van der Voo and others, 1980); (3) biogeographic indications of a late Paleozoic position between eastern and western Pacific faunal realms (Mamet and Pinard, 1985); (4) the low paleolatitude and eastern Pacific affinity of Triassic bivalves of the terrane (Tozer, 1982; Newton, 1983; Silberling, 1985); and (5) occurrence of the terrane outboard of the Cache Creek terrane, which contains Permian fusulinid faunas of Tethyan (equatorial) affinity (Monger and Ross, 1971) and apparently remained in an oceanic setting into Jurassic time (Cordey and others, 1987). Accretion against the western margin of inboard terranes probably began during Early or Middle Jurassic time (McClelland and Gehrels, 1987b; Gehrels and Saleeby, 1985) and was completed by the early Tertiary.

Chugach terrane (C on Fig. 2)

The Chugach terrane has two structural components (Plafker and others, 1977; Johnson and Karl, 1985; Gehrels and Berg, 1984): (1) a strongly deformed but coherent assemblage of flyschoidal graywacke, argillite, and slate of Late Cretaceous age; and (2) a deformed and disrupted assemblage (melange) composed of blocks of basic volcanic rocks, radiolarian chert, ultramafic rocks, limestone, and plutonic rocks in a matrix of cherty, tuffaceous argillite. The composition and age of some blocks suggest that they probably were derived from upper Paleozoic and Triassic strata of Wrangellia. Greenschist- to amphibolite-facies regional metamorphism overprints local remnants of blueschist-facies metamorphism. Radiolarians in chert in the matrix of the melange are generally Late Jurassic and Early Cretaceous in age. Upper Jurassic *Buchias* occur in blocks and possibly *in situ* in the matrix (Brew and others, 1988). The two assemblages are structurally interleaved in many places, but in general the disrupted assemblage tends to lie structurally above and east of the coherent flysch assemblage. Most workers ascribe formation of the Chugach terrane to plate convergence along the Pacific margin of the Alexander and Wrangellia terranes.

Juxtaposition of the terrane against inboard assemblages is thought to have occurred during mid-Cretaceous time (Decker and others, 1980) based on the age of blueschist-greenschist metamorphism of inboard units. Although Cowan (1982) hypothesizes that the terrane was displaced northward from an original position near Vancouver Island after 40 Ma, there are no known faults along which the postulated offset could have occurred (Plafker, 1987, p. 257).

Stikinia terrane (S on Fig. 2)

The most significant components of the Stikinia terrane in and adjacent to SE Alaska include Devonian carbonate rocks, Carboniferous arc-type volcanic and sedimentary rocks and widespread carbonate rocks, Lower Permian basinal strata, Lower and Upper Permian platformal limestone, and Upper Triassic to Middle Jurassic arc-type volcanic, plutonic, and clastic sedimentary rocks (Fig. 2: Monger, 1977; Gehrels and Berg, 1984; Robert G. Anderson, oral commun., 1987). Most of the terrane in British Columbia is covered by Jurassic and Cretaceous sedimentary and volcanic rocks; Triassic and older strata crop out primarily along the eastern flank of the Coast Mountains. The boundary between these strata and high-grade metamorphic rocks in the Coast Mountains is in most areas obliterated by plutons of the Coast Mountains batholith. In some regions, however: (1) an east-dipping fault juxtaposes high-grade rocks against strata of the Stikinia terrane; (2) strata belonging to the Stikinia terrane grade with increasing metamorphism into the high-grade rocks; and (3) Upper Triassic strata apparently overlie high-grade metamorphic rocks (Souther, 1971; Berg and others, 1978; Werner, 1977, 1978; Bultman, 1979; Monger and Berg, 1987; Brew and others, 1985; Hill and others, 1985; Crawford and others, 1987).

Rocks of the Stikinia terrane are known to have been displaced because they occur outboard of Cache Creek rocks containing Permian fusulinid faunas of Tethyan or equatorial affinity (Monger and Ross, 1971), and their primitive Nd-Sr isotopic signature precludes primary relations with North America (Samson and others, 1987). Their accretionary history remains enigmatic, however, because: (1) paleomagnetic data from Permian and Triassic rocks of the Stikinia terrane do not record significant latitudinal transport relative to North America (May and Butler, 1986; Irving and Monger, 1987); (2) the Cache Creek terrane apparently remained in an oceanic setting through Early to Middle Jurassic time (Cordey and others, 1987); and (3) paleomagnetic data from Cretaceous strata and from older rocks with interpreted Cretaceous magnetic signatures record large-scale northward transport in Cretaceous to early Tertiary time (Irving and others, 1985; Marquis and Globerman, 1987).

Taku terrane (T on Fig. 2)

The Taku terrane is a poorly known assemblage of deformed and metamorphosed strata of Early Permian, Middle and Late Triassic, and perhaps pre-Permian age (Silberling and others, 1982; Brew and Grybeck, 1984). As mapped on figure 2, the terrane also contains a significant proportion of Upper Jurassic to mid-Cretaceous strata of the Gravina belt (Gehrels and Berg, 1984; Rubin and Saleeby, 1987a, b), lower Paleozoic rocks of the Alexander terrane (Saleeby, 1987), and Triassic and Jurassic(?) rocks that belong to Wrangellia (Plafker and others, 1988). Regionally significant pre-Jurassic components include: Permian crinoidal marble intercalated with pelitic phyllite and felsic metatuff; Permian(?) basaltic metatuff, agglomerate, and pillow flows; Middle and Upper Triassic basalt, pillow basalt, basaltic breccia, carbonaceous limestone, slate, and phyllite; Jurassic and Cretaceous(?) calcareous flysch; undated quartzite and quartzofeldspathic gneiss presumably derived from felsic volcanic rocks; and metaconglomerate containing clasts of granitic rocks, quartzite, and fine-grained clastic strata. Rocks of Jurassic(?) and Cretaceous(?) age include greenschist- and amphibolite-facies metagraywacke, meta-argillite, metabasaltic pillow flows and breccia, and metaconglomerate.

Rocks of the Taku terrane can be subdivided into a variety of assemblages, the relations between which are as yet unknown (Monger and Berg, 1987). Near Haines (Fig. 2), Upper Triassic basalt and overlying Triassic and Jurassic(?) sedimentary rocks are reported to be geochemically and biostratigraphically similar to Wrangellian strata in western British Columbia and southern Alaska (Plafker and Hudson, 1980; Davis and Plafker, 1985; Plafker and others, 1988). This sequence is overlain conformably by undated calcareous flysch. Northwest of Juneau, Permian(?) and Triassic metabasaltic pillow flows predominate and are overlain unconformably by less-deformed Jurassic and Cretaceous flysch of the Gravina-Nutzotin belt (Redman, 1984; Gehrels and Berg, 1984). In southern SE Alaska, Triassic metasedimentary rocks predominate and contact relations with Jurassic and Cretaceous strata are obscured by Late Cretaceous deformation and metamorphism. Rubin and Saleeby (1987a, b) and Saleeby (1987) report that much of what has been mapped as the southern Taku terrane consists of lower Paleozoic metasedimentary and metavolcanic rocks of the Alexander terrane. In central SE Alaska, the terrane includes Permian and Triassic metasedimentary and metavolcanic rocks and a thick sequence of metarhyolite, metabasalt, and quartz-rich metaturbidites of unknown age and affinity (Gehrels and McClelland, 1988a). Hence, the Taku terrane, as shown on figure 2, includes rocks that belong to the Wrangellia terrane to the north, and to the Gravina belt and Alexander terrane to the south. Permian and Triassic rocks of the terrane in the central and southern part of the panhandle may be southern continuations of the Wrangellia terrane rocks to the north, or they may comprise a distinct tectonic assemblage.

Contact relations with adjacent terranes are poorly known. To the southwest, the terrane is generally thrust southwestward over Jurassic and Cretaceous strata of the Gravina belt. In the Haines area and adjacent parts of Canada the Denali fault marks the southwestern contact. To the northeast, rocks of the terrane increase in metamorphic grade to amphibolite and locally granulite facies and are intruded by plutons of the Coast Mountains batholith. We tentatively draw the eastern boundary within tonalitic plutons along the western edge of the batholith, although metamorphic rocks within the batholith are lithically indistinguishable from some high-grade members of the Taku terrane.

Wrangellia terrane (W on Fig. 2)

A coherent sequence of unfossiliferous strata on Chichagof and Baranof Islands is interpreted to be a fragment of the Wrangellia terrane on the basis of similarities in lithic types and age (Plafker and others, 1976; Jones and others, 1977; Berg and others, 1978). The sequence is distinguished by: (1) thick, mainly subaerial basalt flows (Goon Dip Greenstone) similar to those of the Middle and (or) Upper Triassic Nikolai Greenstone in southern Alaska (Jones and others, 1977); (2) shallow- to deep-marine carbonate rocks (Whitestripe Marble) that are similar to the Upper Triassic Chitistone Limestone; and (3) pelitic sedimentary rocks similar to the Upper Triassic and Lower Jurassic McCarthy Formation. Jurassic tonalitic plutons are the youngest components of the terrane. The sequence apparently overlies a heterogeneous assemblage of upper(?) Paleozoic mafic volcanic rocks, pyroclastic rocks, clastic sedimentary rocks, and minor chert and marble ranging in metamorphic grade from greenschist to amphibolite facies.

The contacts between these rocks and adjacent terranes are poorly known. Along much of the eastern boundary they are apparently juxtaposed against rocks of the Alexander terrane along a Tertiary right-lateral fault (Peril Strait fault) -- the original boundary between the two is difficult to identify due to emplacement of abundant Jurassic(?) and Cretaceous plutons and widespread metamorphism and deformation along the boundary. Elsewhere on Baranof Island and western and northern Chichagof Island the Wrangellia terrane is juxtaposed against rocks of the Chugach terrane along the Border Ranges fault, which is interpreted as a west-vergent thrust (Plafker and others, 1976).

If correlations with rocks in other parts of the Wrangellia terrane are correct, then the rocks in SE Alaska must also have been transported considerable distances northward since Late Triassic time (Jones and others, 1977; Hillhouse and Gromme, 1984; Tozer, 1982).

Gravina belt (G on Fig. 2)

The Gravina belt comprises Upper Jurassic to mid-Cretaceous marine argillite and graywacke, interbedded andesitic to basaltic volcanic and volcaniclastic rocks, subordinate polymictic conglomerate, and perhaps plutons ranging from quartz diorite to dunite and peridotite (Berg and others, 1972, 1978; Gehrels and Berg, 1984). These strata occur in a narrow belt separating the Alexander and Taku terranes and record the transition from lower-grade rocks on the west to higher-grade rocks along the flank of the Coast Mountains. In general, the metamorphic grade increases from greenschist or sub-greenschist facies to the west to amphibolite facies toward the east. Contact relations with adjacent terranes are uncertain. Although strata of the Gravina belt are interpreted to depositionally overlie rocks of the Alexander terrane (Berg and others, 1972), depositional contacts between the two assemblages are apparently preserved only on Gravina Island (Berg, 1973) and Kupreanof Island (McClelland and Gehrels, 1987a). In contrast, the Gravina rocks depositionally overlie metamorphosed and deformed rocks of the Taku terrane northwest of Juneau (Redman, 1984) and possibly on Chilkat Peninsula (Plafker and others, 1988). Similar relations may also occur near Ketchikan (Gehrels and Berg, 1984; McClelland and Gehrels, 1987b; Charles Rubin, oral commun., 1987).

The eastern margin of the Gravina belt is in most areas difficult to identify. In southern SE Alaska, high-grade metamorphic rocks assigned to the Taku terrane were probably derived in part from Gravina belt protoliths. To the north, the eastern margin may occur along strike-slip or thrust faults along the west flank of the Coast Mountains batholith or within tonalitic bodies belonging to the batholith.

Regional relations suggest that the Gravina belt is part of a basinal assemblage that accumulated along the eastern margin of a previously juxtaposed Alexander terrane and Wrangellia terrane and continued eastward across the Taku terrane (Berg and others, 1972, 1978). The continuation or correlatives of Gravina belt strata east of the Taku terrane have not yet been identified.

Metamorphic rocks of the Coast Mountains batholith (M on Fig. 2)

Metasedimentary and metavolcanic rocks comprise approximately 20% of the Coast Mountains batholith and consist primarily of pelitic, semi-pelitic, and quartzofeldspathic schist and gneiss and subordinate amphibolite, quartzite, marble, and calc-silicate rocks. These rocks have been referred to as components of the Central Gneiss Complex by previous workers. Protoliths are generally interpreted to have been argillaceous marine strata, limestone and (or) dolomite, chert, and subordinate mafic to felsic volcanic rocks. Some rocks may also have been derived from plutonic protoliths. Protolith ages of Proterozoic(?), early Paleozoic(?), Carboniferous(?), Permian(?), Triassic, Jurassic(?), and Cretaceous(?) are indicated by: (1) relations north and east of Juneau which suggest that the metamorphic rocks locally grade eastward into Triassic and older strata of the Stikinia terrane, and are at least locally overlain by the Triassic strata (Souther, 1971; Werner, 1977, 1978; Bultman, 1979; Brew and others, 1985); (2) a preliminary Rb-Sr isochron of Proterozoic apparent age determined on high-grade metamorphic rocks along the Alaska-British Columbia border north of Juneau (L.J. Werner and R.L. Armstrong, *in* Monger and Berg, 1987; Werner, 1977, 1978); and (3) regional relations which suggest that metasedimentary rocks in the central part of the batholith southeast of SE Alaska were derived from Jurassic and Cretaceous strata (Douglas, 1986), from the Jurassic Bowser Lake Group (Woodsworth and others, 1983), and from strata of Permian(?) (Hill, 1985) and pre-Permian(?) (Hutchison, 1982) age (Hill and others, 1985).

Regional amphibolite- and locally granulite-facies metamorphism occurred primarily during Late Cretaceous and early Tertiary time, although metamorphism prior to deposition of Jurassic and Cretaceous strata of the Gravina belt, prior to Triassic time, and between Proterozoic and Carboniferous time may have previously affected various parts of the Coast Mountains batholith.

Intrusive suites of the Coast Mountains batholith

Plutons of the batholith generally belong to three distinct suites (shown separately on figure 2) that become progressively younger toward the east, and to a large unit of undivided granodioritic rocks ranging in age from Early(?) Cretaceous to Paleocene. The oldest suite comprises narrow but very long sheet-like masses of hornblende-dominant tonalite and quartz diorite that extend in a linear fashion along the western margin of the batholith. These tabular bodies (commonly referred to as "tonalite sills") are interpreted by some workers as marking a fundamental tectonic boundary within the batholith (Berg and others, 1978; Brew and Ford, 1981; Gehrels and Berg, 1984). Strong foliation and lineation within the bodies and their contact relations with country rocks suggest that they were intruded during the later stages of regional metamorphism and deformation within the Coast Mountains. U-Pb (zircon) ages on individual bodies appear to young southward from near 70 Ma in northern southeastern Alaska (Barker and others, 1986), through 67-64 Ma in central SE Alaska (Gehrels and others, 1984), to 55-60 Ma in southernmost SE Alaska and adjacent parts of British Columbia (Arth and others, 1988; Armstrong and Runkle, 1979).

East of the tonalitic bodies are discrete plutons to large batholithic complexes of Paleocene granodiorite. These bodies are commonly elongate but appear to have been emplaced after most of the deformation in the batholith. In southern SE Alaska these bodies apparently engulf the tonalitic bodies and are interpreted to comprise most of the batholith. The youngest and volumetrically most significant suite in the batholith comprises huge bodies of biotite-dominant granodiorite of Eocene age (Gehrels and others, 1984; Gehrels and Berg, 1984). These rocks were apparently emplaced at shallow crustal levels, as their volcanic cover (Sloko Group) is locally preserved adjacent to the plutons.

Barker and Arth (1984), Barker and others (1986), and Arth and others (1988) conclude that plutons in the batholith are components of an Andean-type or continental margin arc formed in response to subduction of oceanic crust. In contrast, Monger and others (1982), Kenah and Hollister (1983), and Crawford and others (1987) indicate that some components may be anatectic melts generated during the main phase of deformation and metamorphism in the Coast Mountains.

Intrusive suites west of the Coast Mountains batholith

Intrusive bodies west of the batholith belong to several suites, including, from oldest to youngest:

(1) Large, generally isolated plutons predominantly of granodiorite composition that intrude the Alexander and Wrangellia terranes. K-Ar ages on these bodies are generally Early Cretaceous, but some bodies may be coeval with similar plutons in the Saint Elias Mountains region that yield Late Jurassic K-Ar ages (Dodds and Campbell, 1988). These intrusive rocks are tentatively interpreted to be genetically related to Upper Jurassic to Lower Cretaceous volcanic rocks of the Gravina belt.

(2) Zoned ultramafic complexes ranging in composition from dunite, commonly in the centers of the complexes, to clinopyroxenite (Taylor, 1967; Irvine, 1967, 1974). These bodies yield K-Ar ages of Early to mid-Cretaceous (Lanphere and Eberlein, 1966). The ultramafic bodies intrude Triassic and older rocks of the Alexander terrane, Permian(?) and Triassic(?) rocks of the Taku terrane, and probably Jurassic and Cretaceous strata of the Gravina belt. It has been argued that these bodies are subvolcanic to mafic, pyroxene-rich flows in the Gravina belt (Irvine, 1973, 1974).

(3) Granodioritic, tonalitic, and subordinate quartz monzonite to quartz diorite bodies on the west flank of the Coast Mountains that intrude strata of the Taku terrane and Gravina belt. Most intrusive bodies contain biotite and (or) hornblende, many contain garnet, muscovite, and primary epidote, and some are pyroxene-bearing. K-Ar, $^{40}Ar/^{39}Ar$, and U-Pb ages indicate emplacement primarily during mid-Cretaceous time. Geobarometric studies of epidote and garnet in these bodies suggest that they crystallized at mid- to lower crustal levels (Zen and Hammarstrom, 1984a, 1984b). Arth and others (1988) conclude that these plutons formed in a subduction-related magmatic arc based on geochemical and isotopic analyses in the Ketchikan area.

(4) Large granodioritic bodies of Eocene and Oligocene age that intrude Chugach, Wrangellia, and Alexander terranes in northwestern SE Alaska. The rocks range from muscovite and locally garnet-bearing granodiorite, granite, and tonalite in the Baranof Island-Glacier Bay area, to biotite- and hornblende-bearing quartz diorite and granodiorite in the Chilkat Range.

(5) Stocks of biotite-, hornblende-, and pyroxene-bearing granite, alkali granite, quartz monzonite, granodiorite, and diorite, and of layered and locally zoned bodies of gabbro, quartz gabbro, and other mafic-ultramafic intrusives. These stocks occur in two distinct regions, one extending from the Coast Mountains east of Ketchikan northwestward to the northern tip of Kuiu Island, and the other in northern SE Alaska on Chichagof Island and in the Glacier Bay area. K-Ar ages on these bodies are generally Oligocene and Miocene. The bodies in southern and central SE Alaska intrude the Coast Mountains batholith, Gravina belt, and the

Taku terranes, whereas the northern assemblage intrudes the Alexander, Wrangellia, and Chugach terranes.

Quaternary and Tertiary strata (QT on Fig. 2)

Tertiary and Quaternary strata underlie large regions of Kupreanof, southern Admiralty, and western Baranof Islands and occur in many other more restricted areas throughout SE Alaska. Figure 2 shows the distribution of these strata only where they cover large regions. In central SE Alaska these strata include the lower and middle Tertiary Kootznahoo Formation (non-marine sandstone, shale, and conglomerate) and Admiralty Island Volcanics (basalt and andesite), and younger basaltic to rhyolitic volcanic rocks and associated sedimentary rocks. West of Glacier Bay, Oligocene(?) and Miocene strata (not shown on figure 2) belong to the Cenotaph Volcanics (basalt) and the Topsy Formation (marine calcareous sandstone and siltstone). Tertiary and Quaternary basaltic to rhyolitic volcanic rocks and subordinate sedimentary rocks also occur at Mt. Edgecumbe (west of Sitka), in the Coast Mountains east of Ketchikan and Petersburg, in the western Prince of Wales Island region, on islands in Cross Sound, and in many other areas.

RELATIONS AMONG TERRANES

The primary and present-day relations among the terranes of southeastern Alaska are controversial. Uncertainties about their similarities and differences and about the existence and nature of boundaries between them arise from the fact that the geology of much of the panhandle has been studied only in reconnaissance fashion, and because many critical relations within and between terranes are obscured by Cretaceous and early Tertiary metamorphism, deformation, and (or) plutonism. To date, two fundamentally different interpretations of the tectonic framework of SE Alaska have been proposed. Berg and others (1978) and Monger and Berg (1987) believe that the Alexander, Chugach, Stikinia, Taku, and Wrangellia terranes, and the metamorphic rocks of the Coast Mountains batholith, each have distinct lithic components and tectonic histories, and that each is (or was) fault bounded. In contrast, Brew and Ford (1983, 1984) believe that the differences between most of these terranes result from facies changes within a single crustal fragment. Specifically, Brew and Ford (1984) suggest that Permian and Triassic rocks of the Taku and Stikinia terranes are facies-equivalents of the upper parts of the Alexander terrane, and that the metamorphic rocks of the Coast Mountains batholith and the older rocks of the Stikinia terrane are facies equivalents of the lower parts of the Alexander terrane.

In the following sections we assess what is known about the similarities and differences among the Alexander, Taku, Wrangellia, and Stikinia terranes and the metamorphic rocks in the Coast Mountains batholith, and offer some tentative interpretations about primary relations among the terranes.

Alexander-Wrangellia relations

The Alexander and Wrangellia terranes were originally interpreted as separate tectonic entities prior to their juxtaposition during Jurassic time (Berg and others, 1978; Coney and others, 1980). This interpretation has recently been revised because Pennsylvanian dioritic and syenitic intrusive bodies are now known to intrude both terranes and their boundary in southern Alaska and southwestern Yukon (MacKevett and others, 1986; Gardner and others, 1988). These relations indicate that the Alexander and Wrangellia terranes have been in proximity since at least Pennsylvanian time. In addition, it is likely that Upper Triassic rocks of the Alexander terrane are facies equivalents of the Upper Triassic rift assemblage of the Wrangellia terrane (Gehrels and others, 1986).

Pre-Pennsylvanian relations between the two terranes, however, are as yet uncertain. The Devonian through Permian volcanic and basinal sedimentary assemblages that characterize the Wrangellia terrane in British Columbia (Jones and others, 1977; Brandon and others, 1986) are different from the carbonate-dominated upper Paleozoic rocks of much of the Alexander terrane (Craig subterrane). It is possible that the Wrangellia terrane rocks correlate with distal sedimentary and volcanogenic components of the Admiralty subterrane, but a rigorous comparison of these two assemblages must await more detailed studies of the Admiralty subterrane.

Alexander-Taku relations

Rigorous comparisons between the Taku terrane and adjacent assemblages are hindered by a lack of age constraints on most protoliths of the Taku terrane. Recent studies have also shown that in many areas, rocks previously assigned to the Taku terrane belong to other assemblages. In the Ketchikan area, for example, Saleeby (1987) and Rubin and Saleeby (1987a, b) conclude that the Taku terrane of Monger and Berg (1987) consists of lower Paleozoic rocks of the Alexander terrane and Jurassic and Cretaceous strata of the Gravina belt, as well as the Permian and Triassic metasedimentary and metavolcanic rocks that are characteristic of the Taku terrane. In contrast, in northern SE Alaska, Plafker and Davis (1985) and Plafker and others (1988) argue on the basis of geochemical and biostratigraphic similarities that Triassic strata of the northern Taku terrane are correlative with Wrangellia terrane basalts and overlying sedimentary rocks in the Alaska Range and in British Columbia. These relations, the proximity of Permian and Triassic Taku rocks to older Alexander terrane strata near Ketchikan, and the pre-Triassic linkage of the Alexander and Wrangellia terranes are consistent with a scenario in which the Triassic rocks in the Alexander, Wrangellia, and Taku terranes are parts of a once-contiguous rift assemblage. The differences in Upper Triassic rock types among the three terranes may reflect varying positions in the extensional environment: bimodal volcanic rocks and coarse conglomerate of the Alexander terrane may have formed on thicker, more evolved crust near the basin margin; flood basalts of the Wrangellia terrane may be the result of extension within ensimatic or less-evolved crust; and basalt and fine-grained clastic strata of the Taku terrane may have formed within an entirely basinal regime.

The principle arguments against primary links between the Alexander and Taku terranes are that: (1) Permian rocks are known in only two restricted regions of the Alexander terrane in the panhandle but apparently constitute much of the Taku terrane; (2) in spite of their present-day close proximity, Triassic lithic types and stratigraphic relations in the two terranes are quite different; and (3) zircon populations in U-Pb samples from the Alexander terrane do not show evidence of inheritence (Gehrels and Saleeby, 1987b; Gehrels and others, 1987), whereas Cretaceous intrusive bodies in the Taku terrane have inherited significant Precambrian zircon components (Rubin and Saleeby, 1987a).

Correlation of metamorphic rocks of the Coast Mountains batholith

The high metamorphic grade, penetrative deformation, and lack of protolith age control limit arguments concerning the regional tectonic affinity of metamorphic rocks of the Coast Mountains batholith. Most relations indicate, however, that rocks along the eastern margin of the batholith either are metamorphic equivalents of the Stikinia terrane strata or, as shown schematically on figure 3, belong to a metamorphic complex that may be overlain and intruded by Triassic rocks of the Stikinia terrane. These metamorphic rocks are apparently indistinguishable from rocks in the western part of the batholith and in some eastern, high grade, parts of the Taku terrane. In addition, inherited Precambrian zircon components also occur in intrusive bodies in both the Taku terrane (Rubin and Saleeby, 1987a, b) and the Coast Mountains batholith (Gehrels and others, 1984). Thus, although the suite of tonalitic bodies in the batholith and (or) the Coast Range megalineament may mark the primary boundary between the batholith and the Taku terrane (Berg and others, 1978; Brew and Ford, 1978, 1984; Gehrels and Berg, 1984; Arth and others, 1988), it is not yet possible to document a significant change in protolith content across either one. We draw the boundary within the belt of tonalitic bodies because we do not view the Coast Range megalineament as a significant tectonic boundary.

Brew and Ford (1984) have suggested that metamorphic rocks in the Coast Mountains batholith are the metamorphic equivalents of strata in the lower part of the Alexander terrane. Beyond a general comparison of proportions of rock-types, this possibility is difficult to test geologically because so little is known about the protolith age of the metamorphic rocks. Isotopically, however, the two can be distinguished on the basis of the (1) presence of inherited zircon components in the batholith (Gehrels and others, 1984) but not in the Alexander terrane (Gehrels and Saleeby, 1987b, Gehrels and others, 1987), and (2) significantly more primitive $^{87}Sr/^{86}Sr$ and $^{143}Nd/^{144}Nd$ initial ratios in the Alexander terrane (Samson and others, 1987, 1988) than in intrusive bodies of the Coast Mountains batholith (Barker and others, 1986; Arth and others, 1988).

TECTONIC HISTORY OF SOUTHEASTERN ALASKA

The currently decipherable tectonic history of SE Alaska begins during latest Proterozoic(?) to Early Cambrian time with the formation of an intraoceanic arc-type basement for the Alexander terrane. Arc-type activity, punctuated by Late Cambrian to Early Ordovician and Middle Silurian to earliest Devonian orogenic events, continued through Silurian and perhaps into Devonian time. The early Paleozoic paleoposition of the terrane within this tectonically active, intra-oceanic regime is problematic. Gehrels and Saleeby (1984, 1987a) argue that the terrane bears tectonic similarities with orogenic systems that formed along the paleo-Pacific margins of Australia, Antarctica, and crustal fragments now residing in Asia, and hypothesize that the terrane may have formed within the western part of the paleo-Pacific Ocean basin. As noted by Savage (1987), however, early Paleozoic faunas of the Alexander terrane are different from faunas found in eastern Australia, and more closely resemble North American forms. In apparent contrast to both comparisons, Nd-Sr isotopic data indicate that the terrane is constructed of juvenile crustal materials and that it was not near any continental landmasses during early Paleozoic time (Samson and others, 1987, 1988).

Proterozoic(?) and lower Paleozoic(?) rocks along the eastern margin of the Coast Mountains batholith differ from those in the Alexander terrane because they are dominated by quartz-rich clastic strata and yield Rb-Sr isotopic data consistent with an age of approximately 900 Ma (L.J. Werner and R.L. Armstrong, *in* Monger and Berg, 1987). These rocks may have formed in a continental margin environment and are reported by Werner (1977, 1978) and Bultman (1979) to form the depositional basement to Triassic rocks of the northern Stikinia terrane. The primitive Nd-Sr isotopic signature of rocks of the central Stikinia terrane suggests, however, that this older metamorphic basement does not extend beneath the central part of the Stikinia terrane.

Beginning in Devonian time, the Wrangellia and Stikinia terranes and the Admiralty subterrane of the Alexander terrane all evolved in an environment characterized by intraoceanic arc-type volcanic rocks, basinal marine clastic sediments, and subordinate carbonate rocks. In contrast, upper Paleozoic rocks of the Craig subterrane record tectonic stability through at least Late Pennsylvanian time and perhaps through the mid-Permian. The Wrangellia terrane and the Craig and Admiralty subterranes were probably in close proximity during most of this time (MacKevett and others, 1986; Gardner and others, 1988; Muffler, 1967; Berg and others, 1978; Jones and others, 1981). These relations, combined with Nd-Sr isotopic data from upper Paleozoic rocks of the Craig subterrane and Stikinia terrane, require the large tectonic fragments in and adjacent to the panhandle to have evolved in an intraoceanic realm through late Paleozoic time. Similarities between Alexander terrane faunas and both North American and Tethyan forms (Mamet and Pinard, 1985; Ross and Ross, 1983, 1985) are consistent with an intraoceanic setting within the paleo-Pacific basin.

Triassic rocks of the Alexander and Wrangellia terranes are interpreted to have formed in a rift environment (Jones and others, 1977; Gehrels and others, 1986). In the Wrangellia terrane, huge volumes of tholeiitic flood basalt covered the terrane, whereas in the Alexander terrane a bimodal volcanic suite was erupted along the eastern margin of the terrane. Triassic basalt and andesite of the Stikinia terrane are interpreted to have erupted within a volcanic arc environment, presumably related to subduction along the eastern (inboard) margin of the terrane (Monger and Ross, 1971). The tectonic environment of Triassic rocks of the southern part of the Taku terrane is unknown. The northern part is interpreted as a rift-fill sequence that developed on and along the northeastern margin of the composite Alexander and Wrangellia terranes by Plafker and others (1988).

The tectonic history of SE Alaska after Triassic time is dominated by accretion of the Alexander and Wrangellia terranes against the Stikinia or other inboard terranes. An unconformity separating Upper Jurassic to mid-Cretaceous strata of the Gravina belt from underlying Triassic and older rocks is the first evidence of this accretionary activity. Prior to Late Jurassic time, Permian and Triassic rocks of the Taku terrane were deformed and regionally metamorphosed (Gehrels and Berg, 1984), and rocks of the eastern part of the Alexander terrane were deformed and disrupted along the Duncan Canal shear zone on Kupreanof Island (McClelland and Gehrels, 1987a). This deformation is interpreted to record either the northward movement of the composite Alexander-Wrangellia terrane along the California-Washington continental margin (Gehrels and Saleeby, 1985), or perhaps the initial juxtaposition against the western margin of the Stikinia terrane (McClelland and Gehrels, 1987b).

Rocks of the Gravina belt accumulated along the western margin of a marine basin of unknown width. As proposed by Berg and others (1972), volcanism within this basin was probably distally related to granitic plutonism in the Alexander terrane, to formation of part of the Chugach accretionary complex, and to plate convergence along the outboard margin of the Alexander and Wrangellia terranes. The Gravina belt as a depositional basin may have formed as: (1) an extensional structure within or behind a west-facing arc (Berg and others, 1972; Brew and Ford, 1983); (2) a collapsing sedimentary basin that records closure of the suture between the Alexander and Stikinia terranes (Pavlis, 1982); (3) a western continuation of the Jurassic and Cretaceous marine basin that formed on the Stikinia terrane (Muller, 1977); (4) a pull-apart structure in a right-lateral transform system along which the outboard terranes were transported northward (Gehrels and Saleeby, 1985); or (5) a fore-arc basin with respect to a northeast-facing arc constructed along the inboard margin of the composite Alexander-Wrangellia terranes (Fred Barker, written commun., 1988). Without additional information, all of these scenarios apparently remain viable.

Structural accretion of the Alexander terrane against the western margin of the Stikinia terrane began soon after deposition of mid-Cretaceous strata of the Gravina belt (Berg and others, 1972, 1978; Coney and others, 1980; Monger and others, 1982; Sutter and Crawford, 1985). This accretionary event is recognized as movement on west-vergent thrust faults, widespread deformation and regional metamorphism of rocks within the Coast Mountains batholith and along its western flank, and anatectic and (or) subduction-generated plutonism within the suture zone separating Alexander and Stikinia (Monger and others, 1982; Arth and others, 1988). These events apparently culminated between approximately 95 Ma and 65 Ma, and were followed soon after by rapid uplift of the Coast Mountains batholith. Thermobarometric studies within the batholith indicate that uplift rates of 2 mm/yr were achieved at about 55 Ma, bringing rocks that formed at over 20 km depth to the surface (Hollister, 1982; Crawford and others, 1987). Gehrels and McClelland (1988b) speculate that much of the early Tertiary uplift of the batholith may have occurred along east-dipping, west-side-up normal faults within and adjacent to the batholith.

Intrusion of Oligocene and Miocene gabbro and granite having low initial $^{87}Sr/^{86}Sr$, and of swarms of lamprophyre and quartz porphyry dikes suggest still younger post-accretionary extensional(?) tectonism, possibly tapping mantle sources. These intrusions trend west-northwesterly, across the regional northwest trends of the Coast Mountains batholith, Taku terrane, Gravina belt, and Alexander terrane.

Southeastern Alaska continues to be tectonically active, with Holocene faulting and uplift (Hudson and others, 1982b), and eruption of lava flows as recently as about 360 +/- 60 years ago (Elliott and others, 1981).

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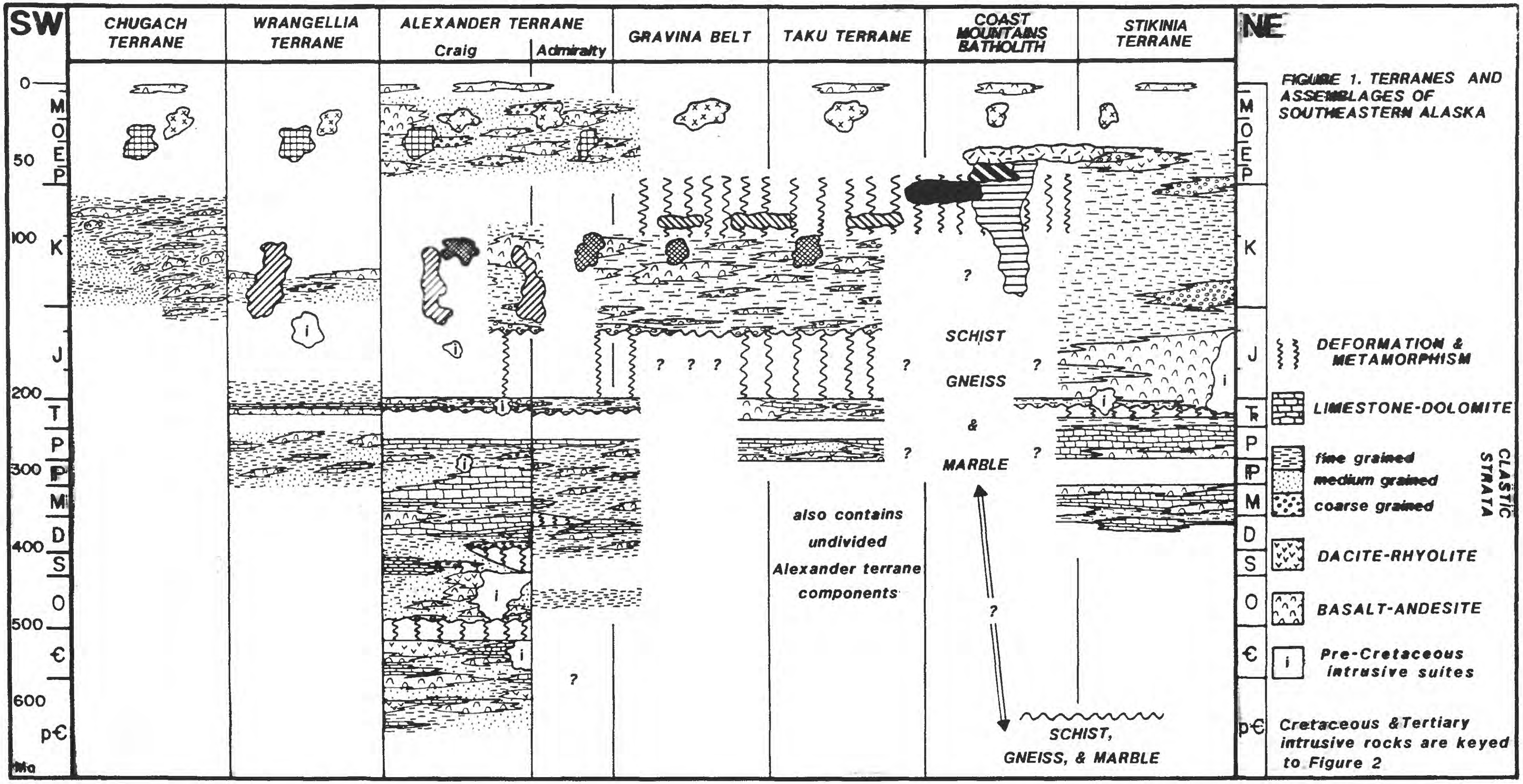

FIGURE 1. TERRANES AND ASSEMBLAGES OF SOUTHEASTERN ALASKA

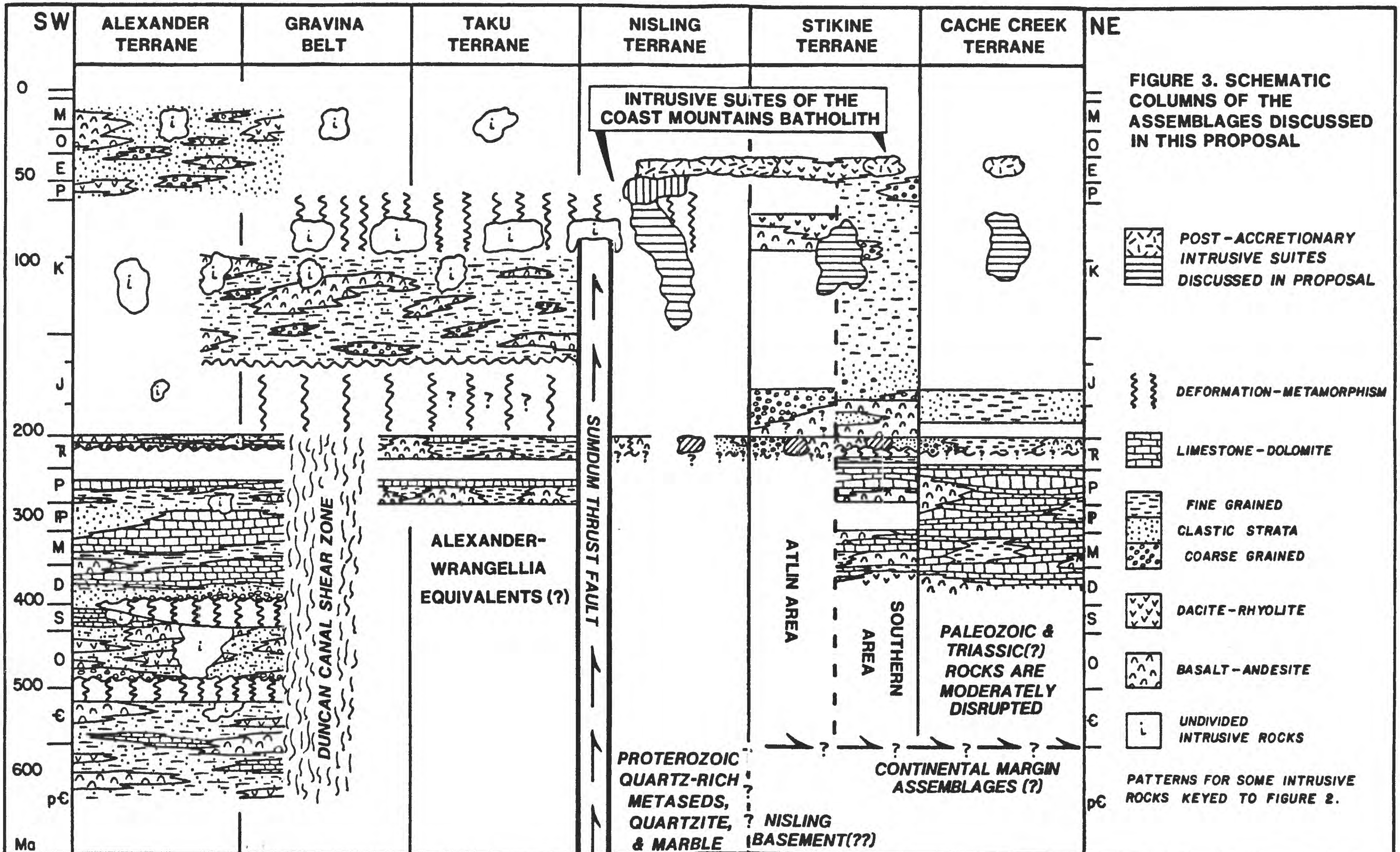

FIGURE 3. SCHEMATIC COLUMNS OF THE ASSEMBLAGES DISCUSSED IN THIS PROPOSAL