ALASKA GEOLOGY

Newsletter of the
Alaska Geological Society

Technical Conference Special Edition

2023 AGS Technical Conference
Responsible Resource Independence
Saturday, April 22, 2023 - Anchorage, Alaska

Welcome!

Join us in Anchorage, Alaska for our 2023 Technical Conference. This conference will emphasize the strong relationship AGS and its members have with the University of Alaska geoscience programs. The theme for this year's technical conference is an ever-growing and important trend in Alaska and that is Responsible Resource Independence.

Keynote Speakers

Cobly VanDenburg - Vice President of Geology, Armstrong Oil & Gas, Inc., Denver CO
An evolution in exploration thinking: From play-opening discovery to the direct detection of hydrocarbons on the North Slope of Alaska

Douglas C. Kreiner, U.S. Geological Survey, Alaska Science Center, Anchorage, AK
Earth Mapping Resources Initiative (Earth MRI): A path towards understanding the distribution of domestic sources of critical minerals

AGS Technical Conference

Date & Time:	Saturday, April 23; 8:30 am – TBD; University of Alaska Anchorage
Place:	ConocoPhillips Integrated Science Building, UAA; 3101 Science Circle, Anchorage, AK
Reservations:	Registration is required. Submit abstract and register at the AGS Website
Joining Remotely:	After registering, you will receive a Zoom link the week of the conference via email on how to join.

An evolution in exploration thinking: From play-opening discovery to the direct detection of hydrocarbons on the North Slope of Alaska

Colby VanDenburg, Vice President of Geology, Armstrong Oil & Gas, Inc., Denver, CO

The Cretaceous Nanushuk Group has been recognized for its petroleum potential since the U.S. Navy's oil discovery at Umiat field in the foothills of the Brooks Range in 1946. Subsequent oil discoveries on the coastal plain at Fish Creek in 1949 and Simpson in 1950 confirmed the regional extent of the Nanushuk petroleum system. Despite these early discoveries, the potential of the Nanushuk Group wasn't fully appreciated until 2013, with the discovery of the multi-billion barrel Pikka field.

The oil accumulation at Pikka field is stratigraphically trapped within topset and upper foreset portions of a series of prograding clinothems. These clinothems are part of the Brookian sequence, a lower Cretaceous through Tertiary progradational system that extends from Eastern Russia across the North Slope into Northwest Canada. The seismic expression of the shelfal portion of the clinothem is typically characterized by high-amplitude planar continuous reflections. These relatively high amplitude events often mask the more subtle expression of the lower topset sandstones, which were deposited in a distal shelf to shelf-edge environment. This shelf-edge environment provides ample accommodation space to preserve a tremendous thickness of sandstone, like those comprising the accumulation at Pikka field.

Although the clinothem geometry is readily apparent on 2D seismic, the internal details within each clinothem require 3D seismic for detailed analysis of stratigraphy. Amplitude versus offset (AVO) attributes help to understand the reservoir architecture as well as the distribution of hydrocarbons within the reservoir. Application of AVO analysis in onshore conventional plays is rare due to typically poor-quality seismic data and the fact that most modern onshore exploration is limited to low-quality reservoirs. In contrast, the emerging Brookian topset play benefits from both high-quality reservoirs and an abundance of high-quality 3D seismic data that allows the prediction of lithology and fluid type in topset targets across the North Slope. The result is the holy grail of exploration: a shallow, low-risk, onshore, conventional oil play spanning hundreds of miles containing multi-billion barrel targets in one of the most prolific petroleum systems in the world.

About the Speaker:

Colby VanDenburg is the vice president of geology at Armstrong Oil and Gas in Denver, CO. He received a B.S. from Montana State University and a M.S. in Geology from Utah State University before beginning his career at Exxon Exploration Company in 1997. Mr. VanDenburg found his home at Armstrong in 2006 after a five-year exploration effort with Red Willow Production Company, the oil and gas division of the Southern Ute Indian Tribe. While at Armstrong, he has explored for oil and gas throughout the Gulf Coast, Rockies, Cook Inlet and North Slope of Alaska. In his current role Mr. VanDenburg provides geologic support for oil exploration, reservoir modeling and geological operations for Armstrong's exploration projects on the North Slope of Alaska. He currently resides outside of Denver, Colorado with his wife and two daughters.

Earth Mapping Resources Initiative (Earth MRI): A path towards understanding the distribution of critical minerals

Douglas C. Kreiner and James V. Jones III, U.S. Geological Survey, Anchorage, AK

Critical minerals are presently defined as non-fuel mineral or mineral material essential to the economic or national security of the U.S. and which has a supply chain vulnerable to disruption (https://www.federalregister.gov/documents/2022/02/24/2022-04027/2022-final-list-of-critical-minerals). These metals are essential to meet modern mandates for zero-emission vehicles and transition to a low-carbon economy. The U.S. Geological Survey's Earth Mapping Resources Initiative (Earth MRI) program was developed to acquire new high-quality datasets (geological, geophysical, geochemical, and topographic) over areas that are favorable for containing critical mineral deposits. Initially, ~$1M/year was provided to Alaska Division of Geological & Geophysical Surveys to support new data collection, and that investment has increased to more than $6.5M in the current year to bolster data collection. The state of Alaska has also prioritized critical minerals exploration and production in Alaska through the establishment of the Office of Energy and Innovation.

The mineral systems concept provides a holistic framework connecting regional-scale geologic factors to the formation and preservation of mineral systems. Mapping mineral systems and their host geologic terranes provides essential insights into the potential formation and distribution of deposits to predict which critical minerals may also be enriched as by- and co-products. Processes that occur over large time and space scales have a profound influence on the enrichment of metals in ore deposits. Focusing on the mineral system rather than the any individual deposit provides a more complete and integrated understanding for sources and sinks of critical minerals.

We have developed a mineral systems framework for Alaska that relates individual deposits and mineral districts to the geologic environments that host them using a process-based approach. We have mapped the general extent of 17 distinct mineral systems that are known or suspected to exist within Alaska, and we delineated more than 100 associated focus areas known or suspected to include most of the commodities that are presently listed as critical. Our mapping was guided by publicly available geologic, geochemical, geophysical, and mineral occurrence datasets that cover most of the state. Mineral resource prospectivity models published by the U.S. Geological Survey for Alaska in recent years provided guidance for evaluating the footprints of mineral systems. The Yukon-Tanana upland of eastern interior AK was selected as the first priority region for new data collection under the USGS Earth MRI program because it has the most spatial overlap of different mineral systems in a single focus area. Our mapping of mineral systems and critical mineral prospectivity and the resulting focus areas provide a strategic framework for prioritizing new research and data collection in Alaska to advance our understanding of domestic critical mineral potential.

About the Speaker:

Doug Kreiner is a research geologist with the U.S. Geological Survey at the Alaska Science Center in Anchorage, Alaska. He completed his B.S. degree in geosciences and environmental studies at Northland College in Ashland, Wisconsin, his M.S. degree in geology at Colorado State University in Fort Collins, and his Ph.D. in economic geology at at the University of Arizona in Tucson. Following the completion of his PhD, Doug worked in industry for 5 years managing porphyry Cu, epithermal and Carlin-style gold exploration programs in the southwestern US and Great Basin. In 2016, Doug joined the USGS where he is continuing to study and apply a system-scale approach to understand the regional metallogeny including the paragenesis and space-time relationships of hydrothermal systems and their tectonic environments. Doug has also been actively focused on developing the strategy for implementation of the USGS research and prioritization of critical minerals since 2019. Doug also serves on international working groups to develop international standards for the mineral systems concept and the role of critical minerals in ore deposits.

Alaska Geological Society Members and Friends – Welcome!

We are looking forward to this year's 2023 AGS Technical Conference. The conference will be held in Anchorage on University of Alaska Anchorage's campus. Like last year, the conference will be a hybrid format with online and in person options. We highly encourage in person attendance if possible.

AGS is a strong supporter of the University of Alaska geoscience programs in Fairbanks and Anchorage. We are a non-profit organization and offer support to university students through our strong scholarship programs and our continued professional and student attended technical conferences and monthly luncheons. We ask you to help us continue this legacy.

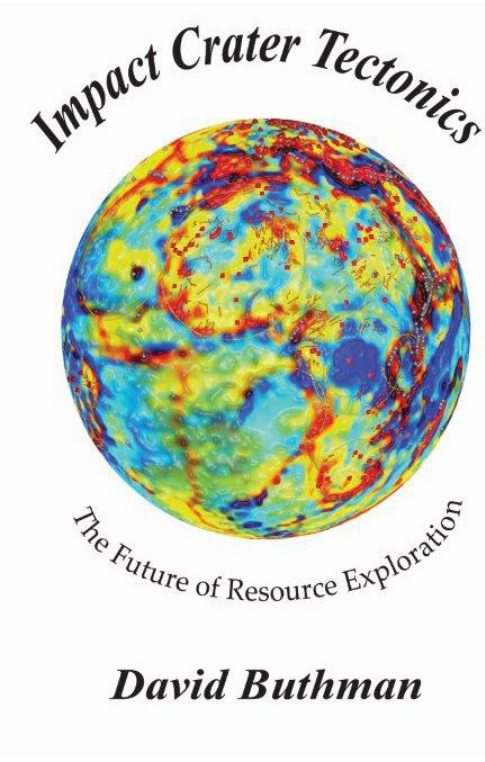
2023 Conference Theme: ***Responsible Resource Independence***

Alaska is rich in natural resources, from precious metals to hydrocarbons. We want to highlight the research and people working toward sustainable, responsible development of these resources in our State.

Saturday, April 22, 2023
UAA ConocoPhillips Integrated Science Building
8:30 am - TBD

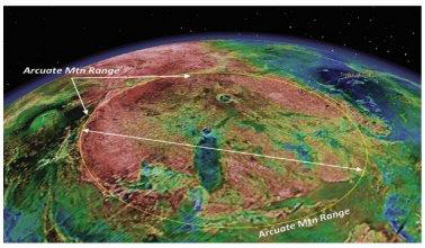
Keynote Speakers: Colby VanDenburg, Armstrong Oil and Gas, Vice President of Geology
Doug Kreiner, US Geological Survey, Critical Minerals

Abstracts are due April 7. Please visit our website at ALASKA GEOLOGICAL SOCIETY - Home (alaskageology.org) to register and submit an abstract.



Impact Crater Tectonics provides a universal geologic framework for the prediction of Earth's mineral resources. Based on sound scientific, mathematic, and geologic principles, the demonstrated relationships between impact craters and mineral resources consecrates an imminent paradigm shift for interpreting the tectonic evolution of Earth, particularly for Alaska.

Full-color, 297-page, 8.5" x 11" perfect-bound book, with over 200 photos, graphs, and illustrations. Available on Amazon, or signed copy from author at ImpactCraterStudies.org.



Pathfinders in Alaska Geology Wall of Fame

The geology of Alaska is exceptionally diverse and complicated. Mapping and understanding Alaska geology are further challenged by remoteness, rugged terrain, severe weather and limited infrastructure. A Pathfinders in Alaska Geology award has been established to recognize outstanding geoscientists that have risen above these difficulties and contributed significantly to synthesizing and understanding the geology, hazards, and resources of the state. These geoscientists will be honored with a photograph and citation on the Alaska Geological Society website and on a dedicated wall in the Geologic Materials Center in Anchorage, Alaska.

David Brew
Alfred Brooks
William Brosgé
A.F. Buddington
Stephen Capps
Robert Coats
Robert "Buck" Detterman
Arthur Grantz
David Hopkins
Ernest Leffingwell
Edward Mackevett
Thomas Marshall
George Martin
Walter C. Mendenhall
John Mertie
Donald Miller
Fred Moffit
Charles "Gil" Mull
Warren Nokleberg
William Patton
Troy Péwé
Louis Prindle
Donald Richter
Frank Schrader
Philip Smith
Josiah Spurr
David Stone
Irv Tailleur
Wesley Wallace
Florence Weber

It is with great honor, pleasure, and humility that the Alaska Geological Society's Pathfinders Committee announces the inaugural class of "Pathfinders in Alaska Geology". This award was established to recognize true trailblazers in the geosciences in Alaska; men and women who made enormous contributions to the general understanding of the geology of the Last Frontier.

The thirty individuals listed at left are inducted as the first Pathfinders class; they will be honored with a permanent display at the Alaska Geologic Materials Center in Anchorage. There also will be an annual dedication ceremony for newly inducted Pathfinders at the Alaska Geological Society's Annual Technical Conference. This year's conference will be held at the University of Alaska-Anchorage on April 22nd, 2023.

The composition of this first class was determined after several months of research and deliberation by a committee of 9 long-time Alaskan geologists. Following the 2023 AGS Technical Conference, the nomination process for future inductees will be posted and open to the public.

Congratulations to the inaugural class – we thank you for your efforts.

"KISSING CLAMS" FROM THE SILURIAN OF GLACIER BAY, SOUTHEAST ALASKA

David M. Rohr[1], Robert B. Blodgett[2], and Vincent L. Santucci[3]

[1]Geology Program, Sul Ross State University, Alpine, Texas 799832
drohr@sulross.edu

[2]Blodgett & Associates, Consulting Geologists, 2821 Kingfisher Drive, Anchorage, Alaska 99502
RobertBBlodgett@gmail.com

[3]National Park Service, Geologic Resources Division, 1849 C Street, NW, Washington, D.C., 20240
vincent_santucci@nps.gov

Kirk (1927a) proposed a giant new bivalve genus named *Pycnodesma* from the Upper Silurian of Southeast Alaska. Two species were established: *P. giganteum* the type species from Glacier Bay and *P. benjamini* from Freshwater Bay (Fig. 1). Subsequently Kirk (1927b) realized that his genus name was preoccupied, and proposed *Pycinodesma* as a replacement name. Kirk (1927a, p. 2-3) suggested that *Pycinodesma* "is notable in being perhaps the largest and most massive Paleozoic pelecypod. The individuals here figured are small to medium in size, owing to the exigencies of collecting in Alaskan localities it was impossible to extract the larger specimens from the massive limestone in which they were embedded. In Glacier Bay I had seen a section of *Pycnodesma giganteum* in the limestone measuring more than 12 inches (30 centimenters)."

Kirk noted occurrences of this genus in Glacier Bay in isolated exposures of limestone (now referred to the Willoughby Limestone – see Figs. 1 and 2). On Willoughby and Drake Islands, which he regarded as the "best collecting groups for the fossil of the lower part of the series", as well as at Freshwater Bay on Chichagof Island (in what is now referred to the Kennel Creek Limestone) (Kirk, 1927a)). In addition, Kirk noted another occurrence further south in Southeast Alaska on the south shore of Kosciusko Island. Kirk (1927a, p. 5) also noted another occurrence of the genus in the Silurian of the Seward Peninsula, probably belonging to *P. giganteum*. The authors here are familiar with another Southeastern Alaskan occurrence of *Pycinodesma* (Fig. 11) in a quarry on Tuxekan Island, between Prince of Wales Island and Heceta Islands.

Excellent exposures of abundant *Pycinodesma* crop out in the Willoughby Limestone (Ross-

man, 1963) at Johnson Cove on Willoughby Island (Figs. 7-9). *Pycinodesma* is also found in the correlative Kennel Creek limestone at Freshwater Bay, Chichagof Island, and in the western part of Prince of Wales Island and Tuxekan Island in the Heceta Formation. The Willoughby Limestone is a remarkably thick formation with an estimated thickness of 1,500 to 3,000 m (Figure 3).

The Silurian-age bivalve genus *Pycinodesma* occurs only in several accreted terranes of Alaska. It is locally abundant in the Alexander terrane of Southeast Alaska. Kirk (1927a) mentioned specimens in the Seward Peninsula, but they were not illustrated. The genus is unknown from cratonic North America (Laurentia) or any other place in the world. The Alexander terrane is interpreted to be the remnants of a continental margin that was rifted from a tropical paleolatitude in northeastern Russia and later sutured to North America during the Mesozoic (Blodgett and Boucot, 2009; Blodgett et al., 2010). It is an easily identified fossil that clearly indicates the presence of Upper Silurian strata in Alaska.

Pycinodesma giganteum (Kirk), the genotype species, is the largest of the two known species and is also greatly thickened, with the external surface of the valves marked by fine concentric lines (see Fig. 5). It is often found in densely congregated mass shell accumulations, packed close to one another, so that local residents of Gustavus at the Glacier Bay refer to them as “Kissing Clams”. The only other named species, *P. benjamini* Kirk (Figs. 10 and 11) is common in the upper part of the Silurian section exposed at Freshwater Bay. It is also large like *P. giganteum*, but is slightly smaller, differing as well in having a different slope to the shell and also being less ventricose (inflated), and also in having a thinner shell, a differing shell outline, and a relatively longer and straighter hinge line.

In terms of paleoecology and environments of deposition, *Pycinodesma* seems to be an inhabitant of restricted shallow shelf, lagoonal biofacies as shown above in Figure 3. This genus commonly occurs in densely packed, monotaxic shell clusters (Figs. 7-9). The distribution of *Pycinodesma* extends to the interface where shelfal edge stromatolite reefs abruptly transition into slope facies. Soja et al. (2000) reported stromatolite reefs and associated lithofacies on Willoughby Island and Drake Island close to beds bearing *Pycinodesma*.

The Silurian rocks of Southeast Alaska (Alexander terrane) are perhaps the thickest and most impressive accumulation of Silurian age strata in North America (see Figs. 2 and 4). Despite the plethora of diverse marine fauna, much remains to be learned about this region. Considerably activity has been undertaken recently of the Silurian at Glacier Bay (Kirk, 1927a, 1928; Blodgett et al., 2012, 2013; Rohr and Blodgett, 2003, Rohr et al., 2003; Soja et al. 2000) and Chicagof Island (Rohr et al., 2011; Kříž et al., 2011; and Boucot et al., 2012). A recent upsurge also occurs in Silurian rocks to the south as well in the southern part of the Alexander terrane (Blodgett, 2012, 2013, Blodgett and Rohr, 2010; Musteikis et al., 2006; Rigby et al., 1994, 2008; Rohr and Blodgett, 2008, 2009, Rohr et al., 2006, 2008, 2009).

REFERENCES

Blodgett, R.B., 2012, *Kirkidium alaskense* (Kirk & Amsden): Alaska Geology – Newsletter of the Alaska Geological Society, v. 42, no. 5, p. 5-6.

Blodgett, R.B., 2013, *Aphrosalpinx textilis* Myagkova, 1955, Calcareous sponge: a common faunal element associated with Upper Silurian reefs of Alaska, Siberia, and the Urals: Alaska Geology – Newsletter of the Alaska Geological Society, v. 43, no. 7, p. 4-7.

Blodgett, R.B., and Boucot, A.J., 2009, The Alexander terrane – A displaced fragment of northeast Siberia? Evidence from Silurian brachiopods and Silurian and Lower Devonian stratigraphy: Geological Society of America Abstracts with Programs, v. 41, no. 7, p. 302.

Blodgett, R.B., Boucot, A.J., Baranov, V.V., and Rohr, D.M., 2013, *Sapelnikoviella santuccii*, a new gypidulinid brachiopod genus and species from the Upper Silurian of Glacier Bay National Park and Preserve, Southeast Alaska: Memoirs of the Association of Australasian Palaeontologists 44: 65-72.

Blodgett, R.B., Boucot, A.J., Rohr, D.M., and Pedder, A.E.H., 2010, The Alexander terrane of Alaska – a displaced fragment of Northeast Russia? Evidence from Silurian-Middle Devonian megafossils and stratigraphy: Memoirs of the Association of Australasian Palaeontologists, v. 39, p. 323-339.

Blodgett, R.B., and Rohr, D.M., 2010, Upper Ordovician-Middle Devonian paleobiogeographic signals from shelly faunas of the Alexander terrane, Southeast Alaska: Geological Society of America Abstracts with Programs, v. 42, no. 5, p. 573.

Blodgett, R.B., Rohr, D.M., and Boucot, A.J., 2002, Paleozoic links among some Alaskan accreted terranes and Siberia based on megafossils, in Miller, E.A., Grantz, A., and Klemperer, S., eds., Tectonic evolution of the Bering Shelf-Chukchi Sea-Arctic margin and adjacent landmasses: Geological Society of America Special Paper 360, p. 273-291.

Blodgett, R.B., Santucci, V.L., and Sharman, L., 2012, An inventory of paleontological resources from Glacier Bay National Park and Preserve, Alaska, p. 43-47, in Weber, Samantha, ed., Rethinking Protected Areas in a Changing World: Proceedings of the 2011 George Wright Biennial Conference on Parks, Protected Areas, and Cultural Sites. Hancock, Michigan. The George Wright Society.

Boucot, A.J., Blodgett, R.B., and Rohr, D.M., 2012. *Strophatrypa*, a new genus of Brachiopoda (Atrypidae), from Upper Silurian strata of the Alexander terrane, northeast Chichagof Island, Alaska: Bulletin of Geosciences, v. 87, no. 2, p. 261-267.

Kirk, E., 1927a, *Pycnodesma*, a new molluscan genus from the Silurian of Alaska: Proceedings of the United States National Museum, v. 71, no. 20, p. 1-9.

Kirk, E., 1927b, *Pycinodesma*, a new name for *Pycnodesma* Kirk not Schrammen: Journal of the Washington Academy of Sciences, v. 17, p. 543.

Kirk, 1928, *Bathmopterus*, a new fossil gasteropod genus from the Silurian of Alaska: Proceedings of the U.S. National Museum, v. 74, article 20, p. 1-4.

Kříž, J., Blodgett, R.B., and Rohr, D.M., 2011, Silurian Bivalvia from the Chichagof Island, Southeast Alaska (Alexander terrane): Bulletin of Geosciences, v. 86, no. 2, p. 241-258.

Musteikis, Petras, Boucot, A.J., and Blodgett, R.B., 2006, A comparison of Upper Silurian brachiopod faunas

of the Alexander terrane of SE Alaska with those of NW Baltica: Geological Society of America Abstracts with Programs, v. 38, no. 5, p. 20.

Rigby, J. K., Nitecki, M. H., Soja, C. M., and Blodgett, R. B., 1994. Silurian aphrosalpingid sphinctozoans from Alaska and Russia: Acta Palaeontologica Polonica, v. 39, p. 341-391.

Rigby, J.K., Rohr, D.M., Blodgett, R.B., and Brooks, B.B., 2008, Silurian sponges and some associated fossils from the Heceta Limestone, Prince of Wales Island, southeastern Alaska: Journal of Paleontology, v. 82, no. 1, p. 91-101.

Rohr, D.M., and Blodgett, R.B., 2003, *Kirkospira*, a new Silurian gastropod from Glacier Bay, southeast Alaska, in Galloway, J.P., ed., Studies in Alaska by the U.S. Geological Survey, 2001: U.S. Geological Survey Professional Paper 1678, p. 117-125.

Rohr, D.M., and Blodgett, R.B., 2008, Silurian Gastropoda from the Alexander terrane, southeast Alaska, p. 51-61, in Blodgett, R.B., and Stanley, G.D., Jr., eds., The Terrane Puzzle: New Perspectives on Paleontology and Stratigraphy from the North American Cordillera. Geological Society of America Special Paper 442.

Rohr, D.M., and Blodgett, R.B., 2009, Ludlovian (Late Silurian) gastropod fauna of the Alexander terrane, southeastern Alaska, and their paleobiogeographic significance: Geological Society of America Abstracts with Programs, v. 41, no. 7, p. 302.

Rohr, D.M., and Blodgett, R.B., 2013, Silurian tropical marine shelf to basin transition at Glacier Bay National Park and Preserve: The “exotic” Alexander terrane of Alaska. Journal of Geography (Chigaku Zaeshi), v. 122, no. 5, p. 905-911.

Rohr, D.M., Blodgett, R.B., and Baichtal, James, 2006, Scaphopoda from the Alexander terrane, southeast Alaska – The first occurrence of Scaphopoda in the Silurian: Palaeoworld, v. 15, p. 211-215.

Rohr, D.M., Blodgett, R.B., Boucot, A.J., and Skaflestad, J., 2011, Upper Silurian facies and fauna of northeast Chichagof Island, Southeast Alaska [abstract]: Pacific Section, American Association of Petroleum Geologists Meeting, Anchorage, Alaska, May 9-11, 2011, Abstract Volume, p. 82.

Rohr, D.M., Blodgett, R.B., and Frýda, J., 2003, New Silurian murchisoniid gastropods from Alaska and a review of the genus *Coelocaulus*, in Clautice, K.H., and Davis, P.S., eds., Short Notes on Alaska Geology: Alaska Division of Geological & Geophysical Surveys Professional Report 120, p. 87-93.

Rohr, D.M., Blodgett, R.B., and Frýda, J., 2008, Silurian Gastropoda from southeastern and west-central Alaska: Journal of Paleontology, v. 82, no. 3, p. 604-611.

Rohr, D.M., Blodgett, R.B., and Frýda, J., 2009, Paleogeographic affinities of Silurian gastropods from southeastern Alaska: Geological Society of America Abstracts with Programs, v. 41, no. 5, p. 27.

Rohr, D.M., Blodgett, R.B., Santucci, V.L, and Slavik, V., 2013, Shallow and deep water origins of Silurian rocks at Glacier Bay, Alaska. Alaska Park Science, v. 12, no. 1, p. 38-43.

Rossman, D.L., 1963, Geology of the eastern part of the Mount Fairweather quadrangle, Glacier Bay, Alaska, in Contributions to general geology, 1960: U.S. Geological Survey Bulletin 1121-K, p. K1-K57.

Soja, C.M., White, B., Antoshkina, A., Joyce, S., Mayhew, L., Flynn, B., and A. Gleason, A., 2000, Development and decline of a Silurian stromatolite reef complex, Glacier Bay National Park, Alaska: Palaios, v. 15, no. 4, p. 273-292.

Figure 1. Silurian strata are exposed on Willoughby and Drake Islands, Marble Mountain, Sandy Cove, and Tidal Inlet in Glacier Bay in Glacier Bay National Park & Preserve. (from Rohr et al., 2013).

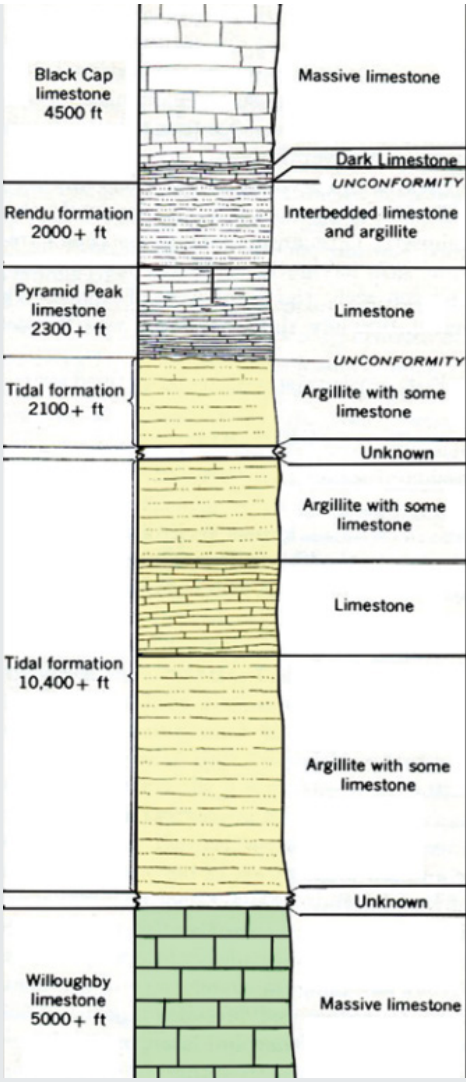


Figure 2. Rossman formally named the Paleozoic formations in Glacier Bay, including the very thick Silurian Willoughby and Tidal Formations. (from Rohr et al., 2013).

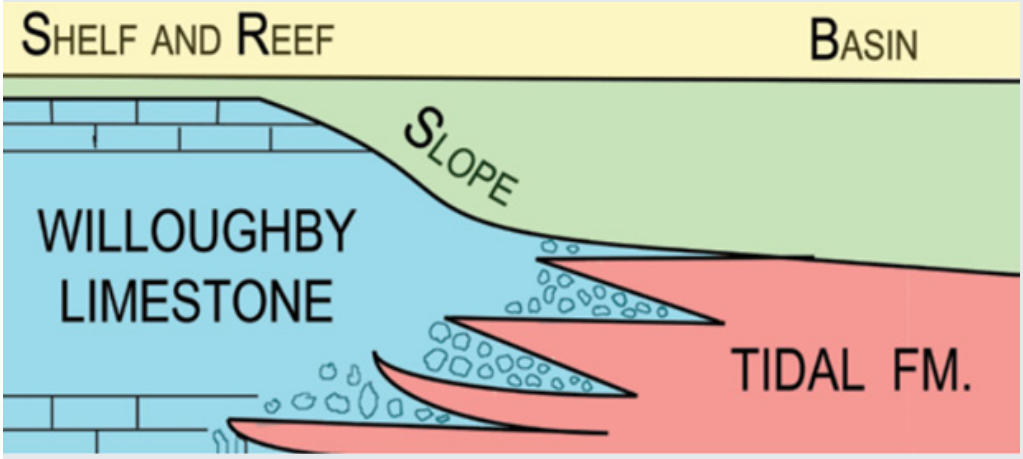


Figure 3. Generalized cross section of our interpretation of the facies relationships between the Willoughby Limestone and the Tidal Formation (from Rohr et al., 2013). The same facies relationships are also indicated in Rohr and Blodgett (2013).

Figure 4. Silurian strata are exceptionally thick at Glacier Bay, perhaps the thickest accumulation of rocks on this age in North America. View to the north in Glacier Bay. Marble Mountain (1,009 m) on the left and Willoughby Island (391 m) on the right consisting entirely of the Willoughby Limestone.

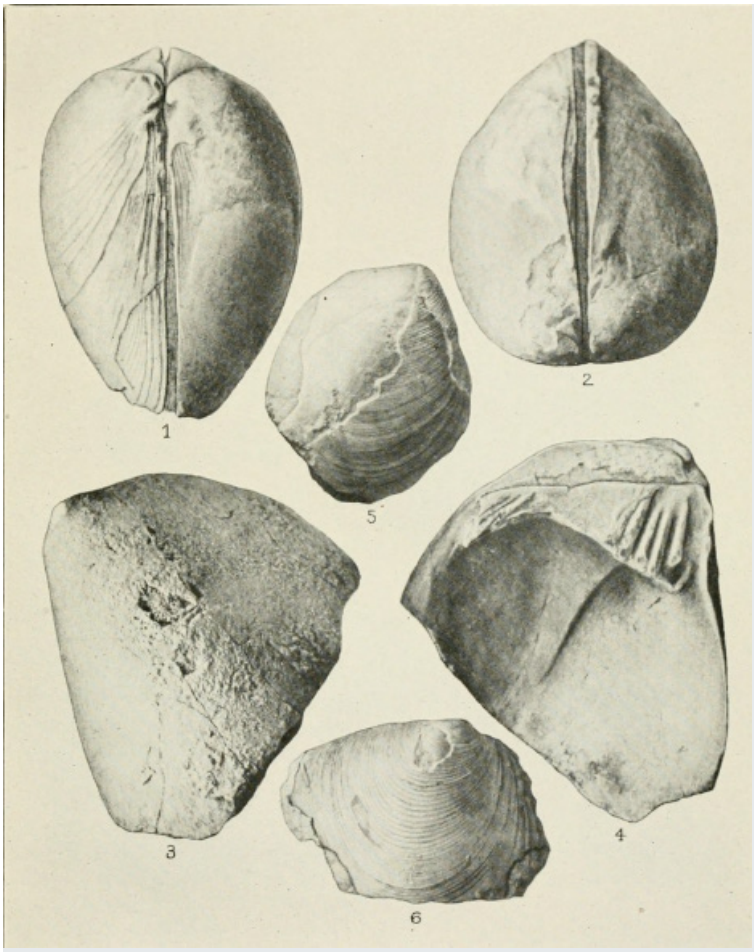


Figure 5. Kirk's (1927a) original illustration of *Pycinodesma giganteum*. Views 1-5 are of the genotype (holotype) specimen. View 6 is of another specimen questionably included in the species. All specimens from Willoughby Limestone, Glacier Bay.

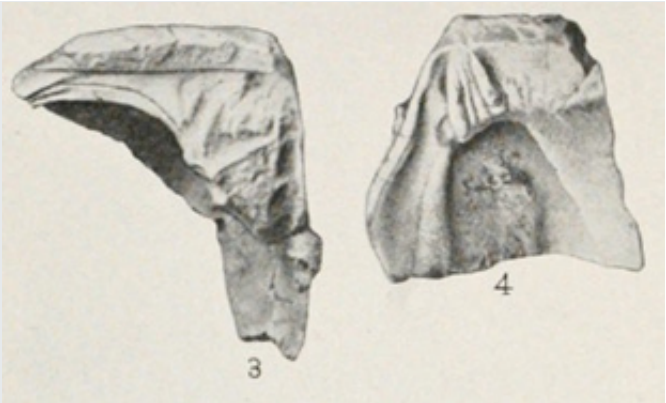


Figure 6. Interior of left and right valves of *Pycinodesma giganteum* (Kirk). From Kirk, 1927a, Pl. 2, figs. 3-4),

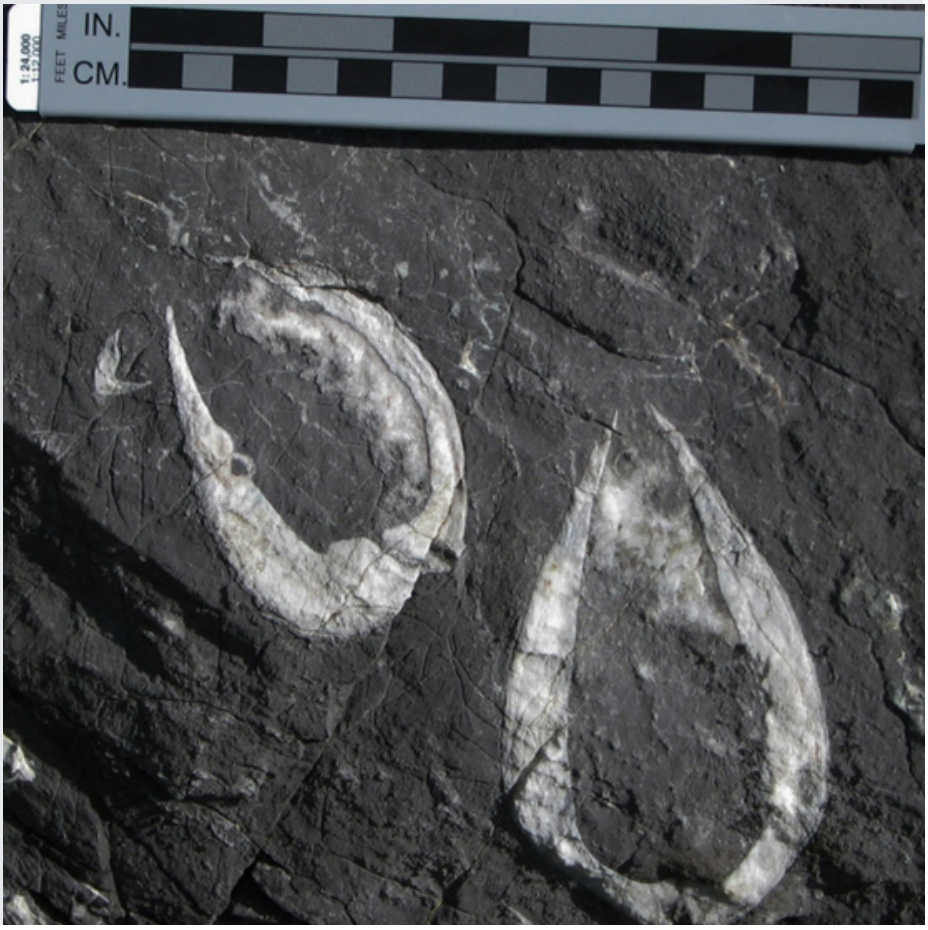


Figure 7. *Pycinodesma giganteum* (Kirk, 1927). As large and thick as the shells are, individual specimens are not silicified and are difficult to separate from the matrix. Note the calcite-spar-filled geopetals inside the shell. Northern part of Willoughby Island.

Figure 8. Two of the authors, Vince L. Santucci (L.) and David M. Rohr (R.) standing near a prominent shell bed of *Pycinodesma giganteum* at Johnson Cove, Willoughby Island, Glacier Bay, Southeast Alaska.

Figure 9. *Pycinodesma giganteum* (Kirk) bed at Johnson Cove, Willoughby Island, Glacier Bay, Southeast Alaska.

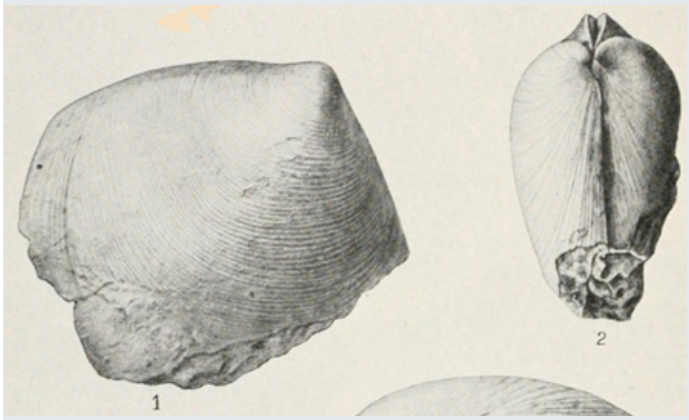


Figure 10. Type specimen of *Pycinodesma benjamini* (Kirk) from the Late Silurian Kennel Creek Limestone, Freshwater Bay, Chichagof Island, Southeast Alaska. (from Kirk, 1927a).

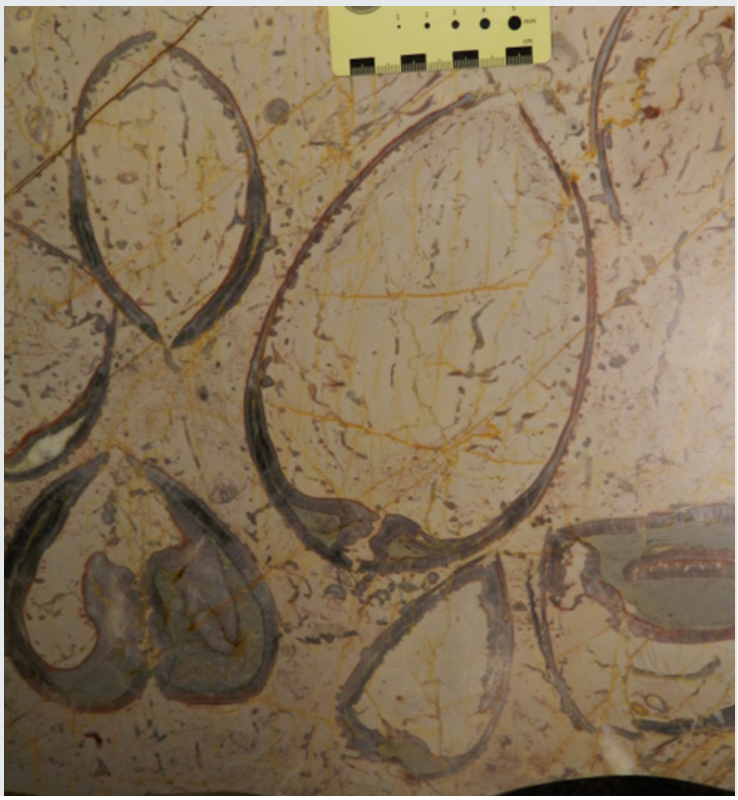


Figure 11. A polished slab with numerous cross sections of *Pycinodesma* shells from a quarry on Tuxekan Island, situated between Prince of Wales Island and Heceta Island, further to the south in Southeast Alaska. The relatively thin nature of the shell substance suggest probable placement in *Pycinodesma benjamini* (Kirk). Slab from the collection of James Baichtal, Southeast Alaska. Lower edge of scale bar demarked in cm.

SEEKING DONATIONS FOR AGS SCHOLARSHIP FUNDS

This is a challenging year for students at all levels, and geoscience students in the universities need our support more than ever. When you pay your membership dues this year, please consider a contribution to an AGS scholarship fund. You can also contribute to AGS scholarships through Pick, Click, Give when you apply for your Alaska Permanent Fund Dividend. **AGS is a 501c3 nonprofit organization and all contributions are tax deductible**.

The Alaska Geological Society offers scholarship awards
to graduate and undergraduate students
who are conducting geoscience research projects in Alaska

including

Alaska Geological Society Scholarships
The Don Richter Memorial Scholarship

Scholarship information and applications are available online at
www.alaskageology.org

The Alaska Geological Society, Inc.
P.O. Box 101288
Anchorage, Alaska 99510

The Alaska Geological Society is a 501c3 nonprofit organization
Donations to these scholarship funds are tax deductible

2023 AGS Scholarship Awards

Scholarship Committee

Chair: Sue Karl - regional geology and tectonics, stratigraphy, sedimentology

Clo Giffen - economic and environmental geology

Peter Haeussler - neotectonics and earthquake hazards

Peter Johnson - petroleum geology and geophysics

Deb McGimsey - geophysics and seismic stratigraphy

Elizabeth Nadin - structural geology

Hannah Rosenkrans - volcanology and ecomonic geology

Donald Richter Memorial Scholarship:

Nolan Vlahovich: MS candidate, University of Alaska, Anchorage

Project: *Magmatic evolution and storage of magmas that fed the 1912 Novarupta eruption*

Alaska Geological Society Scholarships:

Kelly Brigham: MS candidate, University of Massachusetts

Project: *Sources of chemically enriched compositions in arc volcanoes, comparison of Umnak Island and the Wrangell Volcanic Field*

Jason Craig: PhD candidate, Stanford University

Project: *Ancient and active tectonics of Arctic Alaska: structural framework of the south-central Brooks Range and geothermal potential of the Kigluaik Mountains, Seward Peninsula*

Molly McCreary: PhD candidate, University of Utah

Project: *Mapping of a landslide in Serpentine Valley in Prince William Sound, Alaska*

Breauna Murry: MS candidate, South Dakota Mines

Project: *The Togiak Bay volcanic field, western Alaska: the key to unraveling polyphase development of the Alaskan Orocline?*

Pacific Section American Association of Petroleum Geologists Scholarship:

Lucas McCreary: MS candidate, Purdue University

Project: *Understanding the history of the Alaska Mesozoic ocean basin system through the stratigraphy and provenance of the Manley Basin in central Alaska*

The Alaska Geological Society, Inc.
P.O. Box 101288
Anchorage AK 99510
http://www.alaskageology.org

The Alaska Geological Society is an organization which seeks to promote interest in and understanding of Geology and the related Earth Sciences, and to provide a common organization for those individuals interested in geology and the related earth sciences.

This newsletter is the monthly (September-May) publication of the Alaska Geological Society, Inc. 300± newsletters delivered eletronically per month.

Kenneth P. Helmold (Editor)
Alaska Geological Society, Inc.
P. O. Box 101288
Anchorage, AK 99510
e-mail: helmold@alaskan.com
mobile: 907-297-8883

MEMBERSHIP INFORMATION

AGS annual memberships expire November 1. The annual membership fee is $25/year ($5 for students). Lifetime menbership is $250. You may download a membership application from the AGS website and return it at a luncheon meeting, or mail it to the address above.

Contact membership coordintor Kirk Sherwood with changes or updates (e-mail: membership@alaskageology.org; phone: 907-240-2546)

All AGS publications are now available for on-line purchase on our website. Complete catalogue at: http://www.alaskageology.org/publications1.html

ADVERTISING RATES

Advertisements may be purchased at the following rate: $200 for 9 monthly issues (September - May) of AGS newsletter (any size up to full page) and companion ad on AGS website for full year (beginning each September).

Contact Jennifer Crews at jennifer.r.crews@conocophillips.com to place ad.

Pick.Click.Give.

It's PFD Application Time!

Did you know that you can support the society through Pick.Click.Give? When you fill out your PFD application, just select Alaska Geological Society, Inc. in the list of non-profits and you can help AGS to promote the uniqueness of Alaskan Geology and provide for education, geologic research, and networking to all who are interested a well as provide scholarships to students across a wide range of geologic topics.

https://www.pickclickgive.org/index.cfm/pfdorgs.info/Alaska-Geological-Society-Inc

- **From the PFD home page http://pfd.alaska.gov/Application, select the green "Add or Change Your Pick.Click.Give. Donation" button**
- **You can change/add your donation at any time throughout 2021**

Alaska Geological Calendar of Events

Date	Time	Organization	Event	Location
Mar 22, 2023	11:45 am	AGS	Chad Hults, National Park Service. “Rapid interagency response and science discoveries for the 2021-2022 Muldrow Glacier surge, Denali National Park”	Virtual Google Meet & Viewing at BP Energy Center
Apr. 22, 2023	8:30 am - TBD	AGS	AGS Technical Conference, “Theme Responsible Resource Independence”	ConocoPhillips Science Building, UAA
May 2023; Date to be determined	11:45 am	AGS	Speaker to be determined	BP Energy Center & Google Meet &

AMA: Alaska Miners Association; **AGS**: Alaska Geological Society: **GSA**: Geophysical Society of Alaska

AAEP: Alaska Association of Environmental Professionals; **SPE** Society of Petroleum Engineers;

UAA University of Alaska Anchorage.

Membership Note

Membership renewal is November 1; annual dues are:

Full member - $25

Student member - $5

Lifetime membership - $250

2022 - 2023 Alaska Geological Society Board, Committees and Delegates				
Title	**Name**	**Phone**	**e-mail**	**Affiliation**
President	Sarah Frey	907-375-8240	sking11311@gmail.com	Hilcorp
Past-President	Laura Gregersen	907-375-8240	laura.gregersen@alaska.gov	AK DOG
President-Elect	OPEN			
Vice-President	Ben Rickards	210-287-7711	rickards.ben@gmail.com	CononcoPhillips
Treasurer	Corey Ramstad	907-777-8427	cramstad@hilcorp.com	Hilcorp
Secretary	Heather Beat	907-443-3842	heather.beat@alaska.gov	AK DOG
Director 2021-2023	Michael Unger		mike.unger.geo@gmail.com	BOEM
Director 2021-2023	Claudia Cannatelli		ccannatelli@alaska.edu	UAA
Director 2021-2023	Tom Homza	907-301-2851	thomas.homza@shell.com	Shell
Director 2022-2024	Kirk Sherwood	907-240-2546	membership@alaskageology.org	
Director 2022-2024	Matt Frankforter	907-717-6898	mfmattkate@gmail.com	
Director 2022-2024	Vanessa Crandell	907-646-9648	vcrandell-beck@rmconsult.com	R&M Consultants
AAPG Delegate	Ken Helmold	907-297-8883	helmold@alaskan.com	
PSAAPG AGS Representative	Ken Helmold	907-297-8883	helmold@alaskan.com	
Advertising	Jennifer Crews		jennifer.r.crews@conocophillips.com	CononcoPhillips
Education/Science Fair	OPEN			
Field Trips	OPEN			
Bylaws	Sue Karl	907-441-8010	smkarl107@gmail.com	USGS
Memberships	Kirk Sherwood	907-240-2546	membership@alaskageology.org	
Newsletter Editor	Ken Helmold	907-297-8883	helmold@alaskan.com	
Publications	Kirk Sherwood	907-240-2546	publications@alaskageology.org	
Scholarship	Sue Karl	907-441-8010	smkarl107@gmail.com	USGS
Website	Heather Beat	907-443-3842	heather.beat@alaska.gov	AK DOG
Fundraising	Jennifer Crews		jennifer.r.crews@conocophillips.com	CononcoPhillips