NEW ENGLAND INTERCOLLEGIATE GEOLOGICAL CONFERENCE 110TH ANNUAL MEETING

NEW YORK STATE GEOLOGICAL ASSOCIATION 90TH ANNUAL MEETING

Guidebook for Fieldtrips in New York and Vermont

A meeting in honor of Bruce Selleck and William Kidd



Edited by
Tim Grover
and
Helen Mango









NEW ENGLAND INTERCOLLEGIATE GEOLOGICAL CONFERENCE 110TH ANNUAL MEETING

NEW YORK STATE GEOLOGICAL ASSOCIATION 90TH ANNUAL MEETING

Guidebook for Fieldtrips in New York and Vermont

October 12-14, 2018

Edited by
Timothy W. Grover and
Helen Mango

Hosted by
Castleton University and Colgate University



Copies of this guidebook may be purchased for \$35 from the following address:
Geology Program Coordinator
Natural Sciences Department
Castleton University
Castleton, VT 05735

Front Cover Credit

The front cover photo credits are clockwise from top right: William Peck, John Rayburn, Tim Grover, Jean Crespi, Tim Grover

The NEIGC logo is courtesy of Lindley Hanson.

The field guides for this Conference are offered under the terms of the Creative Commons Attribution-Non-Commercial 3.0 Unported

All field tripguides are available for free download by following this link: www.castleton.edu/neigc-nysga

DISCLAIMER

Before visiting any of the sites described in New England Intercollegiate Geological Conference guidebooks, you must obtain permission from the current landowners.

Landowners only granted permission to visit these sites to the organizers of the original trips for the designated dates of the conference. It is your responsibility to obtain permission for your visit. Be aware that this permission may not be granted.

Especially when using older NEIGC guidebooks, note that the conditions and accessibility at field trip locations may have changed drastically. Likewise, geological interpretations may differ from current understandings.

Please respect any trip stops designated as "no hammers," "no collecting" or the like.

Consider possible hazards and use appropriate caution and safety equipment.

NEIGC and the hosts of these online guidebooks are not responsible for the use or misuse of the guidebooks.

TABLE OF CONTENTS

Welcome and Forewordiv					
Memo	orial and Dedication to Bruce Selleck				
Dedic	Dedication to William Kidd				
List o					
A1.	Migmatites of the Eastern Adirondack Mountains: New Constraints on the Timing, Petrology, and Tectonic Setting of Partial Melting – <i>Mike Williams</i> , <i>Tim Grover</i> , <i>Claire Pless</i> , <i>Kaitlyn Suarez</i> , <i>and Sean Regan</i> 1				
A2.	Geology of the Carthage-Colton Shear Zone and Lyon Mountain Granite: An Adirondack Field Trip in Honor of Bruce Selleck – <i>William Peck, Eric Johnson, and Martin Wong</i>				
A3.	Structural and Stratigraphic Features of the Taconic Foreland, NW Vermont – <i>Adam Schoonmaker and William Kidd</i>				
A4.	New Views on the Deglaciation of Mt. Mansfield – Paul Bierman, Lee Corbett, Stephen Wright, P.T. Davis, Chris Halstead, and Jeremy Shakun				
A5.	Iapetan Rift-Passive Margin Transitions in NE Laurentia and Eustatic Control on Continental Slope Oxygenation, Taconic Slate Colors, and Early Paleozoic Climate – <i>Ed Landing and Mark Webster</i> 81				
B1.	Geology of the Copper-Kiln Landslide: A Glimpse into the Marcy Massif Detachment Zone – Sean Regan, Victor Guevara, Tess Drauschak, and Jeff Chiarenzelli				
B2.	The Piseco Lake Shear Zone: A Shawinigan Cryptic Suture in the Southern Adirondack Mountains, New York – Dave Valentino and Jeff Chiarenzelli				
В3.	Fault Systems of the Taconic Foreland; Whitehall, NY to West Haven, Vermont [All Kinds of Faults!] – William Kidd, Steve Howe, and Chul Lim				
B4.	New Insights into Glacial Lakes Vermont and Albany – John Rayburn, David DeSimmone, and Amy Frappier				
C1.	The Cheever and Mineville Iron Oxide-Apatite (IOA) Deposits – Marian Lupulescu, Jeff Chiarenzelli, Dave Bailey, Sean Regan, and Jared Singer				
C2.	Geology of the Northern Taconic Allocthon: Strain Variation in Thrust Sheets, Brittle Faults, and Postrift Dike Emplacement – <i>Jean Crespi</i> , <i>Jennifer Boemmels</i> , and <i>Jessica Robinson</i>				
C3.	A Traverse Through the Suture Zone Between Laurentia and the Moretown Terrane in Northwestern Massachusetts – <i>Paul Karabinos</i> , <i>Francis Macdonald</i> , <i>and James Crowley</i>				
C4.	Mount Greylock as a Cosmogenic Nuclide Dipstick to Determine the Timing and Rate of Southeastern Laurentide Ice Sheet Thinning – Chris Halsted, Jeremy Shakun, P. Thompson Davis, Paul Bierman, Lee Corbett, and Alexandria Koester				
C5 .	Heavy Metal Contamination from Illegal Burn Piles in an Ecologically Sensitive Site in West Haven, Vermont – Helen Mango, Mary Droege, J. Murray McHugh and Michelle Hluchy291				

Welcome

Welcome to the 110th Annual Meeting of the New England Geological Conference, the 90th meeting of the New York State Geological Association, and the beautiful Lake George Region. Trips during this meeting will range from the High Peaks region of the Adirondacks to the summits in the Green Mountains, the Taconics, and the Berkshires in Massachusetts. Trips will also visit the Champlain Valley and the upper reaches of the Hudson Valley. Participants will have the opportunity to examine geologic features ranging from Mesoproterozoic, granulite facies, metamorphic rocks that formed in the middle to lower crust to mud and sand presently on the surface of the Earth. Topics of discussion will range from major and trace element bulk rock geochemistry to REE behavior in monazite to cosmogenic isotopes to chemical contamination from burn piles; from climate in the Early Paleozoic to relatively recent periods of glacial advance and retreat; and from ductile to brittle deformation mechanism. There is something for everyone!

This meeting is dedicated to Bruce Selleck and William Kidd. Bruce Selleck, who unexpectedly passed away just over a year ago, began his work in the region studying the Paleozoic platform sedimentary rocks and later, along with Jim McLelland, published many papers on the Proterozoic rocks of the Adirondacks. Bill Kidd has published many papers on the rocks in the Taconics and the deformed foreland basin rocks. Many of us have learned a great deal from these two distinguished geologists and geologic educators at meetings such as this one or other field excursions. More on Bruce and Bill follows in the dedication in this guidebook.

The hosts of this combined NEIGC and NYSGA also wish to recognize the support of the Malcolm '54 and Sylvia Boyce endowment for Geology at Colgate University. Our current students represent the future of the NEIGC and the NYSGA. The organizers tried to encourage student attendance at this conference by keeping the costs of registration and the banquet low. These reduced costs were made possible by the generous support of the Malcolm '54 and Sylvia Boyce endowment for Geology at Colgate University. Thank you!

Foreword

The NEIGC and NYSGA are amazing organizations that we all believe in and feel are incredibly valuable. Both of these organizations are completely run by many folks generously volunteering their time. We thank the many people that made this NEIGC and NYSGA happen. First thanks to all the field trip leaders who gave generously of their time to put their field guides together and run the trips. Thanks also to Dyk Eusden who set a high bar running the previous NEIGC meeting. We did our best to try to achieve that standard. Dyk was very patient answering our many questions. Thanks also to Brigette Olsen at Castleton University Camps and Conferences office for designing and implementing the online registration process and thanks to Castleton University's Office of Advancement for hosting the conference webpage. Thanks to Tom Wysocki and the staff at the Fort William Henry Hotel for their assistance with the lodging, welcoming reception, and banquet. Thanks to Lindley Hanson of Salem State for updating and maintaining the official NEIGC website and to Joe Kopera for serving as Secretary of the NEIGC. Thanks also to Dave Valentino for his years of dedicated service to the NYSGA and for helping us with many aspects of this meeting. We would also like to thank Brain Carl for his work on the NYSGA website. Finally, thanks to everyone that is attending the meeting. We hope you find that it is both educational and enjoyable.

Helen Mango Tim Grover William Peck Martin Wong

Memorial to Bruce Warren Selleck 1949-2017

Bruce Selleck, Thomas A. Bartlett Chair and Professor of Geology at Colgate University, died unexpectedly but peacefully in his sleep July 31, 2017. Bruce was born September 30, 1949 in Potsdam, NY. He was the son of Fred W. and Helen Spanik Selleck, and was raised on the family dairy farm in the town of Pierrepont. On the Albert Marsh USGS 7.5-minute sheet the family farm is designated "Sellecks Corners", and Bruce began his formal education there in a oneroom schoolhouse. Bruce graduated from Colton-Pierrepont Central School in 1967 and received a scholarship to attend Colgate University. Bruce was already interested in geology at that point, and had even attended SUNY Potsdam's field geology course as a high school student. Bruce would often credit his early interest in geology to a excellent ninth grade science teacher, and the particularly good mineral collecting around the farm where he grew up. At Colgate he played varsity soccer and was influenced by Jim McLelland and Bob Linsley, the magnetic poles of the department at that time. Bruce graduated from Colgate with an AB, High Honors in Geology in 1971. That year Bruce also married Nancy Barlow, who he had met when they were both 4-H camp counselors in the Adirondacks. Bruce earned his MA (1972) and PhD (1975) degrees at the University of Rochester, where he was a student of Zeddie Bowen and Bob Sutton and worked on Cambro-Ordovician sedimentology in northern New York for his dissertation.



In 1974 Bruce returned to Colgate as a one-year visiting instructor, but subsequently was asked to interview for a permanent position, and joined the staff as an assistant professor. Bruce would jokingly refer to his three years at Rochester as "the inter-Selleckian period", the only hiatus in his 50 year affiliation with Colgate. Colgate came to rely on Bruce, calling him to serve in many leadership roles, including chair of the geology department (1983–1986 and 2003–2006), associate dean of the faculty (1988–1990), dean of the faculty and provost (1990–1994), and interim dean of the faculty and provost (2011–2012), as well as chair and director of university committees and institutes, and as advisor to a range of sports teams, clubs, and Greek organizations. Bruce also believed strongly in contributing to the community beyond Colgate, and he served on the Town of Lebanon planning board as well as in leadership roles with the Friends of Rogers Environmental Center and the Adirondack Research Consortium. Bruce was a generous and inspirational mentor to many young faculty in and outside of the Geology department, and was well-known to be a gifted and loved teacher. Many of Bruce's students over the years cherish their memories of wonderful field trips with Bruce, and also his words of encouragement at critical moments, and thoughtful advice. Bruce received the Colgate Alumni Corporation Distinguished Teaching Award (1998), the AAUP Teacher of the Year Award (2006), and the Sidney J. and Florence Felten French Prize (2010) in recognition of his outstanding teaching.

Bruce was a very broad geologist with wide-ranging interests. His initial research focused on the Paleozoic sedimentology of New York, but as his career progressed he worked on a variety of projects with students and collaborators around the world. Bruce also diversified his approach to geological problems by learning stable isotope geochemistry and fluid inclusion analysis, turning some of his attention to diagenesis and alteration studies. In the 1990s, with longtime colleague and friend Jim McLelland, Bruce later expanded the scope of his research to include tectonic and geochronologic studies of the Adirondack Mountains. Bruce, who would always describe himself as a sedimentologist, was to co-author over twenty articles on the petrology and structural evolution of the Adirondacks with Jim, Jeff Chiarenzelli, Colgate colleagues, students, and others. Bruce's work on the Carthage-Colton shear zone eventually brought him back to some of the places where he collected rocks and minerals around Sellecks Corners, and he and Eric Johnson took us to some of them during the Friends of the Grenville field conference in 2005. Many geologists will know Bruce from field trips, and he was a active participant in Friends of the Grenville and The New York State Geological Association (NYSGA), leading or co-leading 12 NYSGA trips over the years and organizing the 2008 NYSGA in Lake George. A session on Adirondack and Grenville geology

was held in Bruce's honor at the 2018 Northeastern Geological Society of America meeting in Burlington, VT, and the Adirondack Research Consortium has inaugurated an annual forum on Adirondack Contemporary Issues in his name.

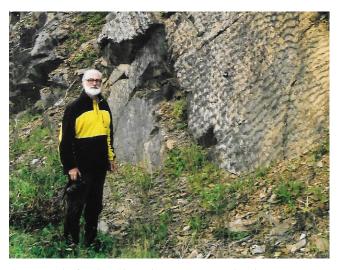
Bruce is survived by his wife of 46 years, Nancy Barlow Selleck, their two daughters, Caity Selleck (Jim Murphy) and Beth Selleck Fiore (Chris Fiore), grandchildren Cooper Murphy and Ellie Fiore; Bruce's two sisters, Linda Selleck Kershlis and Laura Selleck (John Jenkins); Nancy's sister, Cindy Lawrence (Kevin Lawrence); and his nephews, Zachary and Adam.

Dedication to William S. F. Kidd

Adam Schoonmaker, Department of Geosciences, Utica College, Utica, New York 13502

James H. MacDonald¹, Department of Marine and Ecological Sciences, Florida Gulf Coast University, Fort Meyers,
Florida 33965

William S. F. Kidd is an Emeritus Professor of Geology from the University at Albany, SUNY. Bill arrived at Albany in 1974 after completing his Ph.D. in Geology from Cambridge University (via Wales), and a visiting position at the University of Toronto. Bill developed a number of courses at Albany, including teaching Field Mapping for 32 consecutive years! Bill supervised or co-supervised 43 graduate students while at Albany, including numerous students that went on to academic positions at significant colleges and universities. Bill's tenure at Albany coincided with the plate tectonic revolution; the Albany Geology Department at this time was highly influential in that revolution with seminal papers from Bill, John Dewey, Kevin Burke, Akiho Miyashiro, John Bird, Win Means,



and the department's graduate students. Bill's work in the Taconic foreland is an important contribution to our understanding of the processes of plate interactions on subducting margins.

Bill's research focused on the tectonics of continental collisions, specifically the Tibetan Plateau, the Himalayas, and the Appalachians of Newfoundland and New England. Bill's has created many meticulous, highly detailed and amazingly accurate maps, many drawn in the pre-GPS era. Bill's diverse research interests also took him to the depths of the Tamayo and Oceanographer transform faults via ALVIN dives along the East Pacific Rise and Mid-Atlantic Ridge. Bill has been awarded over 1.3 million dollars in grant funding to conduct his research. He has published 91 peer reviewed papers, and over 150 referred abstracts presented at conferences.

Bill has shown great dedication to his students over the years. For many, he emphasized the importance of field observations of rocks and structures. In particular, he stressed the significance of stratigraphy as an indicator of tectonic processes. He has also devoted an incredible amount of energy preserving the work of his students by digitizing their reports and maps to keep their work accessible and relevant to the academic community. Bill's great observational humor translated in the classroom as well as outside. Pepsi University or the Pakistan Institute of Nuclear Science and Technology are just two of many examples of this wonderful observational humor. Notably, he will always call out bullshit.

DATES, LOCATIONS, AND ORGANIZERS OF PREVIOUS NEIGCMEETINGS

110 - 2018	Lake George, NY	Tim Grover and Helen Mango
109 - 2017	Bethel, ME	Beverly Johnson and Dykstra Eusden
108 - 2016		Henry Berry and David West
107 - 2015	Middletown, CT	Martha Gilmore
106 - 2014	Wellesley, MA	Margaret Thompson and David Hawkins
105 - 2013	Millinocket Lake, ME	Lindley Hanson
104 - 2012	Sunapee, NH	Peter Thompson and Timothy Allen
103 - 2011	Middlebury, VT	David West
102 - 2010	Orono, ME	Martin Yates, Chris Gerbi, Alice Kelley, Dan Lux
101 - 2009	Lyndon, VT	David Westerman and Alison Lathrop
100 - 2008	Westfield, MA	Mark Van Baalen and Mike Young
99 - 2007		Louise Corriveau, Tom Clark and Michel Malo
98 - 2006	Rangeley, ME	David Gibson, Julia Daly and Douglas Reusch
97 - 2005	New Haven, CT	Brian Skinner and Tony Philpotts
96 - 2004	Salem, MA	Lindley Hanson
95 - 2003	Amherst and Northampton, MA	John Brady and Jack Cheney
94 - 2002	Lake George, NY	James McLelland and Paul Karabinos
93 - 2001	Fredericton, NB	Dave Lentz and Ron Pickerill
92 - 2000	Orono, ME	Martin Yates, Daniel Lux and Joseph Kelley
91 - 1999	Burlington, VT	Barry Doolan
90 - 1998	Kingston, RI	Dan Murray
89 - 1997	Killington-Pico, VT	Timothy Grover and Helen Mango
88 - 1996	Mount Washington, NH	Mark Van Baalen
87 - 1995	Brunswick, ME	Arthur Hussey and Robert Johnston
86 - 1994	Millinocket, ME	Lindley Hanson and Dabney Caldwell
85 - 1993	Boston, MA	National GSA: Jack Cheney and Chris Hepburn
84 - 1992	Amherst, MA	Peter Robinson and John Brady
83 - 1991	Princeton, ME	Allan Ludman
82 - 1990	La Gaspésie, PQ	Walter Trzcienski
81 - 1989	Farmington, ME	Archie Berry
80 - 1988	Keene, NH	Wallace Bothner
79 - 1987	Montpelier, VT	David Westerman
78 - 1986	Lewiston, ME	Donald Newberg
77 - 1985	New Haven, CT	Robert Tracy
76 - 1984	Danvers, MA	Lindley Hanson
75 - 1983	Greenville-Millinocket, ME	Dabney Caldwell and Lindley Hanson
74 - 1982	Storrs, CT	Ray Joesten and Sidney Quarrier
73 - 1981	Kingston, RI	Jon Boothroyd and Don Hermes
72 - 1980		David Roy and Richard Naylor
	Troy, NY	Gerald Friedman
70 - 1978		Allan Ludman
69 - 1977	Quebec City, PQ	René Béland and Pierre LaSalle
68 - 1976	Boston, MA	Barry Cameron
67 - 1975	Great Barrington, MA	Nicholas Ratcliffe
66 - 1974	Orono, ME	Philip Osberg
65 - 1973	Fredericton, NB	Hugo Grenier and Nick Rast
64 - 1972	Burlington, VT	Barry Doolan and Rolfe Stanley
63 - 1971	Concord, NH	John Lyons and Glenn Stewart
62 - 1970	Rangeley Lakes-Dead River, ME	Gary Boone
61 - 1969	Albany, NY	John Bird
60 - 1968	New Haven, CT	Phil Orville
59 - 1967	Amherst, MA	Peter Robinson, David Drake and Richard Foose
58 - 1966	Katahdin, ME	Dabney Caldwell
57 - 1965	Brunswick, ME	Arthur Hussey
56 - 1964	Chestnut Hill, MA	James Skehan
	77 - 1 - 1 - 1	Note: individual trip leaders are listed for earlier meetings
	I	

55 - 1963	Providence, RI	Quinn, Mutch, Shafer, Agron, Chapple, Feiniger & Hall
54 - 1962	Montreal, PQ	Gill, Clark, Kranck, Stevenson, Stearn, Elson, Eakins, & Gold
53 - 1961	Montpelier, VT	Doll, Cady, White, Chidester, Matthews, Nichols, Baldwin,
	•	Stewart, Dennis, Smith, and Ferrris
52 - 1960	Rumford, ME	Griscom, Milton, Wolfe, Caldwell, and Peacor
51 - 1959	Rutland, VT	
31 - 1939	Kuttanu, v i	Zen, Kay, Welby, Bain, Theokritoff, Osberg, Shumaker, Berry,
70 1070		and Thompson
50 - 1958		Rosenfeld, Eaton, Sanders, Porter
49 - 1957	Amherst, MA	George Bain
48 - 1956	Portsmouth, NH	Novotny, Billings, Chapman, Bradley, Freedman and Stewart
47 - 1955		Rodgers, Walton, MacClintock, Bartolome
46 - 1954	Hanover, NH	Elston, Washburn, Lyons, McKinstry, Stoiber, McNair, and
15 1050	77 0 1 000	Thompson
45 - 1953	Hartford, CT	Flint, Gates, Peoples, Cushman, Aitken, Rodgers and Troxell
44 - 1952	Williamstown, MA	Perry, Foote, McFaden, and Ramsdell
43 - 1951	Worcester, MA	Lougee and Little
42 - 1950	Bangor, ME	Trefethen and Raisz
41 - 1949	Boston, MA	Nichols, Billings, Shrock, Currier, and Stearns
40 - 1948	Burlington, VT	Charlie Doll
39 - 1947	Providence, RI	Alonzo Quinn
38 - 1946	Mt. Washington, NH	Marland P. Billings, Kathrine F. Billings and R.W. Chapman
37 - 1941	Northampton, MA	Balk, Jahns, Lochman, Shaub, and Willard
36 - 1940	Hanover, NH	J. W. Goldthwait, Denny, Shaub, Hadley, Bannerman, and
25 1020	H 4C 1 CT	Stoiber II D. 1 IV/I I
35 - 1939 34 - 1938		Troxell, Flint, Longwell, Peoples and Wheeler
34 - 1938	Rutland, VT NYC-Dutchess Co., NY	George W. Bain O'Connell, Kay, Fluhr, Hubert and Balk
32 - 1936	Littleton, NH	Marland P. Billings, Hadley, Cleaves and Williams
31 - 1935	Boston, MA	Morris, Pearsall, and Whitehead
30 - 1934	Lewiston, ME	Lloyd Fisher and Edward Perkins
29 - 1933	Williamstown, MA	Herdman Cleland, Perry, and Knopf
28 - 1932	Providence-Newport, RI	C. W. Brown
27 - 1931	Montreal, PQ	O'Neill, Graham, T. M. Clark, Gill, Osborne, and McGerrigle
26 - 1930		F. B. Loomis and Gordon
25 - 1929		Irving B. Crosby
24 - 1928	Cambridge, MA	Marland P. Billings, Kirk Bryan, and Kirtley Mather
23 - 1927	Worcester, MA	Perry, Little, and Gordon
22 - 1926	New Haven, CT	C. R. Longwell
21 - 1925	Waterville, ME	Edward H. Perkins
20 - 1924	Providence, RI	C. W. Brown
19 - 1923	Beverly, MA	A. C. Lane
18 - 1922	Amherst, MA	Ernst Antevs
17 - 1921	Attleboro, MA	J. B. Woodworth
16 - 1920		W. N. Rice and Wilbur Foye
15 - 1917	Gay Head, Martha's Vineyard, MA	J. B. Woodworth and E. Wigglesworth
14 - 1916	Blue Hills, MA	W. O. Crosby and C. H. Warren
13 - 1915	Waterbury-Winsted, CT	Jos. Barrell
12 - 1912	Higby-Lamentation Blocks, CT	W. N. Rice
11 - 1911	Nahant-Medford, MA	A. C. Lane and D. W. Johnson
10 - 1910	Hanover, NH	James W. Goldthwait
9 - 1909	Northern Berkshires, MA	H. F. Cleland
8 - 1908	Long Island, NY	Jos. Barrel
7 - 1907	Providence, RI	C. W. Brown
6 - 1906	Meriden-East Berlin, CT	H. E. Gregory
5 - 1905 4 - 1904	Boston-Nantasket, MA Worcester, MA	D. W. Johnson and W. O. Crosby Benjamin Emerson
3 - 1903	West Peak, Meriden, CT	W. N. Rice
2 - 1902	Mount Tom, MA	Benjamin Emerson
1 - 1901	Westfield River Terraces, MA	William Morris Davis
1 1/01	., 55011010 101701 10110005, 17171	** IIIIIII 17101110 DW110