

ON THE ROCKS

A Newsletter of the Michigan Basin Geological Society



2020-2021 Edition 6

www.mbgs.org

March 2021



ANNOUNCEMENTS

MBGS Membership Meeting, March 10th, 7:00PM: Kyle Cox, Graduate Student, Western Michigan University, will present "Proposal for Salt Cavern Compressed Air Energy Storage (CAES) in Michigan".

Join Zoom Meeting: <https://zoom.us/j/2692904048?pwd=Szg2dmNuSHVVSQ3U2cGFZeWhKM1RtZz09>

Meeting ID: 269 290 4048 Passcode: Y0Jciw

Dial by your location

+1 312 626 6799 US (Chicago)

+1 929 205 6099 US (New York)

Meeting ID: 269 290 4048 Phone Passcode: 879143

Volunteer Opportunity: MBGS is in search of a Secretary for the 2020-2021 year. If interested, please contact any one of our executive members.

OTHER NEWS

LED FIELD LENS AND MBGS LANYARD

The Michigan Basin Geological Society is offering geological field hand lens and lanyards. The field hand lens is a large 21mm lens with a 20X magnification. A pair of white LEDs provides illumination for all those darkened close-up viewing of rocks, minerals and fossils. A case is provided for the field lens with a key to remove the batteries. Batteries are included. The green lanyard has MICHIGAN BASIN GEOLOGICAL SOCIETY printed on one side of the 1" wide webbing. This lanyard is designed with a breakaway buckle clip and detachable keychain for versatile use and comfortable wearing. MBGS is offering the Lanyard/LED Hand Lens and Case combo for \$15 each and the Lanyard alone for \$5 each if picked up at a meeting or field trip. If you request to have your purchase mailed, standard costs for mailing container and postage will apply. Please contact Mark Wollensak at wollensak@att.net to order.



March 2021 MBGS Membership Meeting (Free)

When: March 10th, 7:00 PM, 2020 (virtual)

Presentation: Proposal for Salt Cavern Compressed Air Energy Storage (CAES) in Michigan

Presenter: Kyle Cox, Graduate Student, Western Michigan University



Join Zoom Meeting

<https://zoom.us/j/2692904048?pwd=Szg2dmNuSHVSQ3U2cGFZeWhKM1RtZz09>

Meeting ID: 269 290 4048 **Passcode:** Y0Jciw

Dial by your location

+1 312 626 6799 US (Chicago)

+1 929 205 6099 US (New York)

Meeting ID: 269 290 4048 **Phone Passcode:** 879143

Biography

Kyle earned his B.S. in Geological Sciences from Ohio State University in 2012 and his M.S. in Geosciences from Western Michigan University in 2015. He served in the Air Force as a member of the Ohio Air National Guard from 2006-2012. Kyle worked at Chesapeake Energy from 2015-2020 where he initially served as a development and operations geologist for the Appalachia Basin business unit before taking on the role of a Sedimentary Geology subject matter expert in Chesapeake's Geoscience Technology group. Kyle and his wife Nicole missed the snow and greenery, so they returned to Michigan and he is back at WMU where he is currently working on a graduate certificate in "Climate Change Policy and Management". His current focus is researching subsurface energy storage methods suitable for Michigan in collaboration with Consumers Energy.

Abstract

The state of Michigan is attempting to go carbon neutral by 2050. Michigan's two largest power utilities, Consumers and DTE, have pledged to go carbon neutral by 2040 and 2050, respectively. These emissions goals are in part to be achieved by shifting to renewable energy for electricity generation by installing 1000's of MWs of renewable solar and wind generation capacity in the state. Solar and wind are intermittent sources of energy though, which creates obvious problems of supply and demand. Storing energy during times of excess generation for later use is one solution. Shorter duration energy storage technologies such as Li ion batteries are generally able to meet the grid's storage requirements today, but increasing renewable penetration will create a critical need for long duration (≥ 8 -12 hours) grid scale (≥ 100 MW) storage in the near future, a task the Li ion batteries are poorly suited for. Other technologies that are capable of long duration grid scale storage do exist, though. One method appears particularly promising for Michigan, Compressed Air Energy Storage (CAES).

CAES stores mechanical energy in the form of pressurized air. Excess energy from the grid is used to compress air and store it in a reservoir. When energy is needed, the compressed air is released from the container and used to spin a turbine which in turn generates electricity. The storage reservoir can be man-made tanks or geologic reservoirs such as salt caverns, depleted oil and gas fields, abandoned mines, or aquifers containing

non-potable water. Salt caverns are the ideal storage reservoir. Recent DOE studies of the cost of various energy storage technologies show CAES to be the cheapest form of long duration grid scale energy storage on a \$/kWh of storage and levelized cost of electricity basis through at least 2030. The favorable economics for CAES are dependent on the presence of salt formation suitable for housing storage caverns, though. CAES is a proven technology as commercial plants have operated reliably for over 40 years.

Domal salts are generally preferred to the bedded salts like those in Michigan, but the Salina A1, A2, and or B salt beds are thick, pure, and deep enough to support CAES under most of the Lower Peninsula. Many existing salt caverns used for hydrocarbon storage in Michigan are of sufficient volume to support CAES facilities. CAES is already in commercial operation in “Michigan” in a geological sense. A plant was opened in Goderich Ontario in 2019 within the confines of the Michigan Basin and using a storage cavern housed in the Salina. Preliminary analysis indicates individual CAES facilities in Michigan could provide >1000 MWhs of storage, similar to the Ludington Pumped Hydro Facility, at costs that are comparable to or even better than the Ludington Facility.

While the environmental impact of CAES is favorable compared to Li ion batteries and fossil fuel generation in most ways, it is not without environmental costs and risks. The shape and design of most existing salt caverns in Michigan would make them mechanically unstable if used for CAES. Thus, CAES would likely require the solution mining of new salt caverns. Solution mining could require a significant consumptive water use that may not be appropriate and acceptable everywhere (or maybe anywhere) in the state. Brine would need to be disposed of or treated. The risk of subsidence due to cavern instability needs to be considered. Responsibly accounting for these environmental factors could significantly restrict the geographic and economic feasibility of CAES.

The technical feasibility of grid scale CAES implementation in Michigan is strong, the practical feasibility needs to be determined. While multiple vendors of CAES equipment exist, it is not an off the shelf technology, so while the “back of the envelope” calculations of cost and storage capacity are promising, site-specific feasibility studies with real world cost quotes are required. It is not certain if CAES truly aligns with Michigan’s goals. What the state’s energy storage needs will be is still uncertain. Are the environmental risks and water use worth the environmental and economic benefits? The question is not “can we” but “should we”.

The question of “should we” is time sensitive and waiting too long could render it moot. Relevant policy is currently being devised. State groups and committees are actively meeting through initiatives such as Mi Healthy Climate Plan, Mi Power Grid, and the Council on Climate Solutions. The state’s “Energy Storage Roadmap” is currently being developed. Federal efforts such as the BEST Act and DOE Energy Storage Grand Challenge (along with the previously mentioned state initiatives) could provide technical assistance and or funding for studies and pilot projects.

This presentation proposes two things. First, stakeholders such as those responsible for state policies, power utility companies who would operate storage facilities, and relevant public interest groups should be made aware the potential of CAES so they can understand how it compares with their goals. Second, an organization or group of organizations with the capacity to undertake and complete large technically complex projects should perform a site-specific CAES feasibility study.

EVENTS

Many organizations have switched to virtual platforms or have cancelled events. We are providing links for your reference. Please visit these sites to learn more about specific events and happenings. If you have an event to share, let us know!



American Institute of Professional Geologist – Michigan Section – <http://mi.aipg.org/newsletters.htm>

Central Michigan Lapidary and Mineral Society - <http://www.michrocks.org/>

Eastern Section AAPG - <https://www.esaapg.org/>

EGLE Calendar of Events - https://www.michigan.gov/egle/0,9429,7-135-3308_3333---,00.html

Flint Rock and Gem - <https://flintrockandgem.org/events>

Michigan Association of Environmental Professionals - <https://www.maep.org/>

Michigan Basin Geological Society – www.mbgs.org

Michigan Clean Water Corps - <https://micorps.net/about/>

Michigan Mineralogical Society - <https://www.michmin.org/>

Mid-Michigan Rock Club - <http://www.midmichrockclub.com/?Page=1>

Midwest Mineralogical and Lapidary Society - <http://www.mmls.us/>

Society of Petroleum Engineers - <https://www.spe.org/events/calendar/>

Event Schedule

Michigan Basin Geological Society Monthly Meeting – 2nd Wednesday of each month

June 14-16, 2021: Annual Environmental Risk Management Workshop: “The Data Tell the Story” at the Ralph A. MacMullan Conference Center, Roscommon, Michigan.

ONLINE RESOURCES

- **Michigan Geology Maps Available:**
<https://www.michigan.gov/deq/0,4561,7-135-3304-116670--,00.html>
- **Digital Geology Library Overview:**
https://www.michigan.gov/documents/deq/GIMDL-Catalog-2010-01-20_307979_7.pdf
- **GeoWebFace:** https://www.michigan.gov/deq/0,4561,7-135-3311_60700---,00.html
- **Digital Geology Library Mining Overview:**
https://www.michigan.gov/documents/deq/GIMDL-Catalog-2013_06_22_mining_425595_7.pdf
- **Michigan Geological Survey:** <https://wmich.edu/geologysurvey>
- **USGS Michigan Geological Map Data:** <https://mrdata.usgs.gov/geology/state/state.php?state=MI>
- **CMU, Clarke Historical Library, Michigan Geology:**
https://www.cmich.edu/library/clarke/ResearchResources/Michigan_Material_Statewide/Michigan_Oil_and_Gas_Industry/History_of_Michigan_Oil_and_Gas/Pages/Michigan-Geology.aspx

MICHIGAN BASIN GEOLOGICAL SOCIETY OFFICERS 2020-2021

PRESIDENT: CHRIS CHRISTENSEN, Geologist

Michigan Department of Environment, Great Lakes and Energy, Remediation and
Redevelopment Division
350 Ottawa NW, Grand Rapids, MI 49503
(616) 446-7582 christensenc@michigan.gov

VICE PRESIDENT: ADEDOYIN, ADEYILOLA, Ph.D Student

Geophysics and Geomechanics Lab, Dept. of Earth and Atmospheric Sciences,
Central Michigan University, Mount Pleasant, MI 48858
Phone: +1 (701) 739-8214, Email: Adeyila@cmich.edu

SECRETARY: *acting* JOHN A. YELLICH, Director

Michigan Geological Survey, Western Michigan University
1903 West Michigan Ave, Kalamazoo, MI 49008-5241
W (269) 387-8649 C (303) 901-2886; john.a.yellich@wmich.edu

TREASURER: PETER ROSE, Geologist

Office of Minerals Management, Michigan Department of Natural Resources
W (517) 284-5901, RoseP1@michigan.gov

BUSINESS MANAGER: PETER ROSE, Geologist

Office of Minerals Management, Michigan Department of Natural Resources
W (517) 284-5901, RoseP1@michigan.gov

PAST – PRESIDENT: JENNIFER TROUT, Staff Geologist

Michigan Geological Repository for Research and Education
1903 W. Michigan Ave., Kalamazoo, MI 49008-5241
W (269) 387-8633 C (269) 290-4048, jennifer.l.trout@wmich.edu

NEWSLETTER EDITOR: ARLENE ANDERSON-VINCENT, Natural Resource Manager

Nestle Waters North America
19275 Eight Mile Road, Stanwood MI 49346
W (231) 823-8451 arlene.anderson-vincent@waters.nestle.com

PUBLICATIONS: JOHN SHOOK, jshook@detroit salt.com

ELECTRONIC PUBLICATIONS: MARK WOLLENSAK, CPG, wollensak@att.net

WEBMASTER: JOHN ESCH, eschj@michigan.gov



MBGS PUBLICATIONS

<http://www.mbgs.org/publications.html>

Historical publications now available on USB Flash Drives". Each USB Flash Drive is 8GB

Prices include postage, handling and any applicable sales tax.
Orders for publications should be prepaid in U.S. Funds and addressed to:
MBGS — Publications
P.O. Box 14044
Lansing, MI 48901-4044

Historical CD #1: Nine out-of-print publications from 1949 through 1965 and 1998, 2000, \$15

- The Stratigraphy of Manitoulin Island, Ontario, Canada, June 19-20, 1954
- The Devonian and Silurian Rocks of Parts of Ontario, Canada and Western New York, June 22-23, 1951
- The Traverse Group of the Northern Part of the Southern Peninsula of Michigan, June 16-17, 1949
- The Devonian Strata of the London-Sarnia Area, Southwestern Ontario, Compiled by Erwin C. Stumm, Lewis B. Kellum and Jean Davies Wright, June 9-10, 1956
- The Ordovician Rocks of the Escanaba-Stonington Area, Led by R. C. Hussey, June 2-3, 1950
- The Niagara Escarpment of Peninsular Ontario, Canada, June 18-19, 1955
- Lower Paleozoic and Pleistocene Stratigraphy Across Central Wisconsin, Compiled by C. E. Prouty, Led by L. M. Cline, J. L. Hough and R. F. Black, 1960
- Classic Silurian Reefs of the Chicago Area, by Donald G. Mikulic and Joanne Kluessendorf, June 27, 1998
- Geology of Central Ontario, Canada, 1965

Historical CD #2: Four out-of-print publications from 1947, 1959, 1983 and 1991, 2001, \$15

- Copper Country Field Trip, Michigan, June 20-22, 1947
- Geology of Mackinac Island and Lower and Middle Devonian, South of the Straits of Mackinac, June 12-14, 1959
- Tectonics, Structure and Karst in Northern Lower Michigan, August 1983
- Geology of the Pictured Rocks, Upper Peninsula, Michigan, July 11-13, 1991

Historical CD #3: Six out-of-print publications from 1948, 1952, 1990 - 1995, 2001, \$15

- Pleistocene and Early Paleozoic of the Eastern Part of the Northern Peninsula of Michigan, June 18-21, 1948
- Stratigraphy and Structure of the Devonian Rocks in Southeastern MI and Northwestern OH, June 20-21, 1952
- Lower Ordovician and Upper Cambrian of Wisconsin, May 10-12, 1990
- Guidebook to the Precambrian Geology and Metallogeny of the Central Upper Peninsula of Michigan September 12-13, 1991

Historical CD #4: Six out-of-print publications from 1957, 1958, 1961, 1967, 1968 and 1970, 2004, \$15

- Silurian Rocks of the Northern Peninsula of Michigan, 1957
- Cambrian Geology of Parts of Dickinson and Iron Counties, Michigan, June 1958
- Geologic Features of Parts of Houghton, Keweenaw, Baraga and Ontonagon Counties, Michigan, May 19-21, 1961
- Correlation Problems of the Cambrian and Ordovician Outcrops Areas, Northern Peninsula of Michigan 1967
- The Geology of Manitoulin Island, June 1968
- Devonian Strata of Alpena and Presque Isle Counties, Michigan 1970

Historical CD #5: Five out-of-print publications from 1971, 1989, 2001, and Oil & Gas Fields Vol. 1 & 2, 1969 & 1992, 2006, \$50

- Oil & Gas Fields Symposium, Volume 1, April 1969, 200 pp., maps, illus., second printing with updates
- Oil & Gas Fields Manual of the Michigan Basin, Volume 2, 1992, 520 pp., maps, illus.
- Glacial Geology of Southwestern Michigan, 1989, 53 pp. by A. Kehew, L. J. Schmaltz, and W. T. Straw
- Geology of the Lake Erie Islands and Adjacent Shores, 1971, 65pp., maps, illus. by Jane L. Forsyth
- Glacial Geology of Southwestern Michigan, Landforms of the Lake Michigan Lobe, Southwestern Michigan, 2001, AAPG Eastern Section Meeting Field Trip, 32 pp., maps, illus. by A Kehew and A. Kozlowski

Historical CD #6: Six out-of-print publications from 1946, 1953, 1963, 1966, 1978 & 1987 plus the Richfield Challenge, 1952 & Tom Knapp's MS Thesis, 2007 \$15.

- Guidebook for Ordovician Stratigraphy of the Cincinnati, Ohio and Richmond, Indiana Areas, June 12, 13, 1953 by W. H. Shideler and B. T. Sandefur
- Guidebook for Ontario Geological Excursion to Kettle Point – Owen Sound- Waubesaushene, June 21, 22, 23 1946 by W. A. Roliff, C.S. Evans and J.F. Caley
- Guidebook for the Stratigraphy of the Silurian Rocks in Western Ohio, May 31- June 2, 1963 by C. H. Summerson, Jane L. Forsyth, Karl V. Hoover and J. R. Ulteig
- Guidebook for Cambrian Stratigraphy in Western Wisconsin, May 21, 22, 1966 by Merideth E. Ostrom
- Geology of the Manitoulin Area, Special Papers #3, September 29, 30 and October 1, 1978 by J. T. Sanford and R. E. Mosher
- Middle Devonian Cratonic Carbonates and Shales in Southwestern Ontario, November 14, 1987 by Bruce Wilkinson
- The Richfield Challenge, A Review of the Richfield Developments in Michigan, 1952 by Gordon H. Hautan
- A Theory of Rogers City and Dundee Relationships in Central Michigan, Masters Thesis, 1947 by Tom Knapp

Historical CD #7: Field Guidebooks from 1962, 1969, 1977, 1980, 1985 & 1988, \$15

- Silurian Rocks of the Southern Lake Michigan Area, 1962, James H. Fisher, Chairman, MBGS Annual Field Conference
- Studies of the Precambrian of the Michigan Basin, by Harold B. Stonehouse, 1969
- The Geology of the Marquette District: a Field Guide By F. W. Cambray, 1977
- Ordovician and Silurian Geology of the N. Peninsula of Michigan, 1980, R.B. Votaw, 40 pp., illus., maps
- Special Paper #4: Ordovician and Silurian Rocks of the Michigan Basin and its Margins, 1985 K.R. Cercione and J.M. Budai (eds.), 96 pp., illus.
- Upper Keweenawan Rift-Fill Sequence, Mid-Continent Rift System, Michigan, 1988, P.A. Daniels and R.D. Elmore, M.S. Wollensak, ed., 150 pp., illus., maps

OTHER SPECIAL OFFERS

- **Historical CD Set - # 1 – 7 (detailed above) for a special purchase price of \$95**
- **NE Lower Peninsula Geological Field Conf., 2004, T. Black, M. Wollensak, On CD \$10**
- **Stratigraphic Lexicon for Michigan, 2001, prepared by MBGS and published by DEQ, \$4**
- **Robert E. Mosher Geological Studies** A lifetime of geological research on Silurian Rocks with John T. Sanford. The disks are organized chronologically and include field work in North America and Europe. 2007, 2 CDs \$35.



www.mbgs.org

Job Postings

- The Michigan Department of Environment, Great Lakes, and Energy (EGLE) is currently recruiting for a Geologist 12 position within the Water Resources Division. This position is permanent and located at Constitution Hall, 525 W. Allegan Street, Lansing, MI. Interested applicants must apply through NEOGOV.

If you are interested in obtaining more information or applying for this position, click on the link below.

[Click here for posting](#)

- The Michigan Department of Environment, Great Lakes, and Energy (EGLE) is currently recruiting for (2) Geologist 9-P11 positions within the Water Resources Division. These positions are permanent and located at Constitution Hall, 525 W. Allegan Street, Lansing, MI. Interested applicants must apply through NEOGOV.

If you are interested in obtaining more information or applying for this position, click on the link below.

[Click here for posting](#)

Interesting Links

History of the Earth (https://www.youtube.com/channel/UC_aOteuWIY8ITg7DQQspG1g), which is slowly marching through geologic time putting together videos that cover the origin of the solar system, the Earth's oldest rocks, the origin of life and the oxygenation of the atmosphere. They are currently midway through the Precambrian. The videos are gorgeously illustrated and edited.

PBS Eons channel (<https://www.youtube.com/channel/UCzR-rom72PHN9Zg7RML9EbA>). The channel does short clips that focus on many topics in Earth History that are more topical with some videos focusing on specific events.

National Groundwater Associations – Hydrology of States – Webinar Series - Michigan

Date: March 30, 2021

Location: Online 11 a.m.-12 p.m. ET

CEUs: 0.1

Overview:

As hydrogeology varies widely across the United States — and as primary jurisdiction over groundwater development rests with the states — each is unique. This webinar series explores the issues encountered in each of the 50 states — one at a time.

The Michigan hydrogeology webinar, presented by John A. Yellich, CPG, director of the Michigan Geological Survey, focuses on the state's:

- Major aquifers
- Physical and geologic properties
- Groundwater use and availability
- Groundwater quality and contamination
- Surface water/groundwater interactions
- Groundwater management issues.

Who should attend?

- Geologists
- Hydrogeologists
- Hydrologists
- Water well drilling contractors
- Land-use planners
- Federal, state, and local regulatory personnel
- Water-supply managers.

Register at:

[NGWA - Event](#)