Rochester Academy of Science

BULLETIN

"An organization of people in the Natural Sciences"

March 2020 - Vol. 74, #3

President's Message

The Rochester Academy of Science Annual Meeting & Spring Lecture is Thursday, April 2, 7:15 p.m. at the Brighton Town Hall, Community Room.

The Board of Directors election results will be announced at the business meeting at 7:15 p.m. A ballot is included on this page. Please show us your support by returning the completed ballot at the annual meeting.

The Spring Lecture will follow the business meeting. We are delighted to have as our guest speaker, Laura Helft, Ph.D. who will share her work concerning the dramatic loss of birds in North America. She is one of 11 co-authors of the paper, "Decline of the North American avifauna", which caused a great stir when published last October.

Michael Grenier,
President RAS

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Spring Lecture, Thursday April 2, 2018

Birds in Crisis: A Message from the Natural World

Presented by Laura Helft, Ph.D.

New research from several leading ornithology organizations indicates that 3 billion birds have been lost in North America over the last 50 years, or 29%. This staggering finding indicates that action is needed to reverse this trend. Dr. Helft will describe how scientists came to this conclusion, the likely drivers for this decline, and the growing movement to make a difference for birds and the rest of the natural world.

About Our Speaker

Dr. Helft is the Managing Science Editor, Conservation Media, at the Cornell Lab of Ornithology. She received her doctorate in Cell and Molecular Biology from the University of Wisconsin. Previously she worked in the Department of Science Education at Howard Hughes Medical Institute.

As a liaison between the scientific and communications worlds, Dr. Helft works with conservation organizations to make media that is compelling, accurate, and inspirational. She assists in the articulation of communications strategy and execution, and particularly enjoys working with experts from a variety of disciplines to realize conservation action and to educate broad public audiences.

Figure 1: Laura Helft Ph.D., Cornell Lab of Ornithology. Photo credit: James Kegley.

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Table 1: RAS board of directors ballot

ROCHESTER ACADEMY OF SCIENCE
BALLOT FOR JUNE 2020 – MAY 2021 OFFICERS

OFFICE	NAME	√	WRITE-IN CANDIDATE
President:	**Michael Grenier**		
Vice President:	**Daniel Krisher**		
Membership:	**Open**		
Treasurer:	**William Hallahan, Ph.D.**		
Secretary:	**Helen Downs Haller, Ph.D.**		
Member, Board of Directors (2020-2023)	**Douglas Kostyk**		
Member, Board of Directors (2020-2023)	**Karen L. Wolf**		
Member, Board of Directors (2020-2021)	**Michael Richmond, Ph.D.**		
Completed ballots may be delivered in person at the RAS Annual Meeting & Spring Lecture on **April 2nd** or mailed c/o the RAS Secretary: Rochester Academy of Science, PO Box 92642, Rochester NY 14692-0642			

Dating the Devonian Rocks of New York State

by Dan Krisher

The Fossil Section has participated in many outreach events over the years and the two most common questions we get are "is it real" and "how do we know how old it is". The first question is easily handled but the second is more complex and has resulted in what is often euphemistically referred to as a 1-minute elevator speech. What follows is a somewhat expanded version of that speech.

The Middle Devonian rocks in New York state are approximately 385 million years old and there are multiple complementary methods of dating rocks this old. The most common radiometric dating method is called Potassium/ Argon Dating and relies on the radioactive decay of the element Potassium-40 otherwise known as $^{40}_{19}K$. Potassium is one of the most common elements on earth and its nucleus contains 19 protons (its atomic number) and typically 20 neutrons. These two numbers added together give potassium its atomic mass of 39, symbolized as $^{39}_{19}K$. Elements can however appear in different flavors or, to use the technical term, isotopes. Different isotopes of an element always contain the same number of protons but can contain varying numbers neutrons. The usefulness of $^{40}_{19}K$ for our dating needs is because it is not stable. These isotopes will eventually decay into a more stable state and this rate of decay works exactly like a clock.

Potassium-40 is an unstable isotope of the "normal" Potassium-39 and its rate of decay, otherwise known as its half-life, is 1.25 billion years. What this means is if you started with 1 kilogram of $^{40}_{19}K$ sitting on a table and came back in 1.25 billion years, exactly ½ kilogram of the potassium will be gone. The missing Potassium will have decayed into a gas called Argon, and in this case, an isotope of Argon known as Argon-40 ($^{40}_{18}Ar$). Basically, this means if we know exactly how much $^{40}_{19}K$ we started with we can calculate how much time has passed by measuring how much $^{40}_{19}K$ is left. Table 2, at right, illustrates this process.

Using the above information, we can generate good dates if we know how much $^{40}_{19}K$ we started with but unfortunately, in practical terms, we cannot use it for geological dating as we do not know how much $^{40}_{19}K$ we started with. An alternative would be to measure the $^{40}_{19}K$ and $^{40}_{18}Ar$ we have now and use the ratio to determine the age. Unfortunately, argon is a gas which does not linger around after it is formed so we have no way to determine out much was generated by the $^{40}_{19}K$ decay, or do we?

This is where volcanoes come into the picture. Magma contains a significant amount of potassium including the $^{40}_{19}K$ isotope. When magma is in its molten form any $^{40}_{18}Ar$ generated by the decay of $^{40}_{19}K$ is lost as it is a gas and can escape from the magma. When the magma erupts from the volcano, particularly in the form of explosive ash, it cools very quickly and forms various minerals. One of these minerals is zircon in the form of crystals. Potassium is a key element in the formation of zircon, and this naturally includes the some of the $^{40}_{19}K$ isotope.

We now have $^{40}_{19}K$ trapped inside a zircon crystal without the presence of any argon which was lost when the magma was still molten. These zircon crystals are very tough and do not interact with the environment to any great degree. In other words, they make a great safety deposit box for the $^{40}_{19}K$. Over many millions of years, the $^{40}_{19}K$ will decay into $^{40}_{18}Ar$ but the gas is trapped in the crystal, it can't get out.

We can now use highly precise instruments called mass spectrometers to measure the amounts of $^{40}_{19}K$ and $^{40}_{18}Ar$ inside a zircon crystal and use the ratio of the two elements to determine when the crystal was formed. Using this technology dates for the Devonian rocks in the state can be determined plus or minus about a million years and sometimes considerably less. The measurement accuracy is improved by multiple workers measuring multiple crystals in multiple laboratories. This repeated work allows for the statistical generation of high-quality dates.

The final key to providing good dates for rocks is ensuring the location where we find a zircon is the original spot where it was deposited. The "fossil" ashfalls generated by ancient volcanoes are called tephras and these are typically preserved as thin clay-like layers in the sedimentary rock. Great care must be taken to ensure a zircon being used for dating is taken from its original tephra. Because the zircons are so tough a crystal can erode from its original tephra layer and be redeposited many years later and long distances away from its original depositional point. Generating a date using a transported zircon will give an incorrect date for the rocks where it was found as the rocks do not represent the crystal's original deposition.

We are fortunate in New York state as the Devonian rocks here contain many tephra layers as there was considerable volcanic activity due to ongoing mountain building in what is now New England. This has facilitated the construction of a timescale for New

Table 2: Ratio of K^{40} to Ar^{40} as a measure of time

	Start at Time Zero	**375 million years**	**750 million years**	**1 billion years**	**1.25 billion years**
Potassium-40 (Amount)	1 kilogram	0.875 kilogram	0.75 kilogram	0.625 kilogram	0.5 kilogram
Argon-40 (Amount)	0 kilogram	0.125 kilogram	0.25 kilogram	0.375 kilogram	0.5 kilogram

Events for March 2020

For updates to events, check the Academy website, http://www.rasny.org, and Section websites.

NOT MEETING IN MARCH:

Astronomy Star Parties
Life Sciences Field Trip

6 Fri: ASTRONOMY SECTION MEETING

7:30 p.m.–10:00 p.m. RIT Carlson Center for Imaging Science, CAR-1125. Lot F. Main Speaker: Victoria Butler, Ph.D. Candidate, RIT, on the topic: Deployment of the TIME Instrument (mm-Wavelength Spectrometer Array) at Kitt Peak Observatory. Snacks available at 7:00 p.m. prior to meeting. Contact: Mark Minarich: (585) 257-6042.

10 Tue: FOSSIL SECTION MEETING

7:00 – 9:00 p.m. Brighton Town Hall, Downstairs Meeting Room. Training session for local Science Olympiad participants. Section members will be displaying multiple examples of nearly 100 different types of fossils. If you want to examine a wide variety of specimens and update your general fossil knowledge, this is the meeting for you. Contact: Dan Krisher DLKFossil@gmail.com or (585) 698-3147.

11 Wed: LIFE SCIENCE HERBARIUM WORKSHOP

1-4 pm. Basement Rochester Museum and Science Center (RMSC). No experience needed! If you plan to attend, please send an RSVP to Elizabeth Pixley. Contact: Elizabeth Pixley, herbarium curator: 334-0977 or eypixley@gmail.com.

11 Wed: ASTRONOMY BOARD MEETING

7:00 p.m. University of Rochester, Bausch & Lomb Hall, 2nd floor, room 203H. All ASRAS members are welcome. Contact Mark Minarich: (585) 257-6042.

17 Tues: MINERAL SECTON MEETING

7:00 p.m. Brighton Town Hall, downstairs meeting room. Join us on St. Patrick's Day for a talk by Dan Robertson on luck (or no luck) finding mineral deposits. Contact: Stephen Busschaert, (585) 351-7633.

18 Wed: RAS BOD MEETING

7:00 p.m. Brighton Town Hall, Stage Conference Room.

20 Fri: ASTRONOMY WINTER LECTURE SERIES

7:00 p.m.–10:00 p.m. RIT Carlson Center for Imaging Science, CAR-1125. Lot F. Main Speaker: Keith Havey, L3Harris, on current and future space projects. Contact: Mark Minarich: (585) 257-6042.

21 Sat: ASTRONOMY MEMBER OBSERVING: MESSIER MARATHON

7:00 p.m. +. Marian and Max Farash Center for Observational Astronomy, 8355 County Road 14 Ionia, NY 14475. The rain date is Saturday March 28th. Contact Mark Minarich: (585) 257-6042 or see www.rochesterastronomy.org/calendar-of-events.

22 Sun: ASTRONOMY PUBLIC OPEN HOUSE

12:00 p.m. - 4:00 p.m. (or later, if skies are clear). Marian and Max Farash Center for Observational Astronomy, 8355 County Road 14 Ionia, NY 14475. Sledding, weather permitting. For weather related cancellations or changes contact Mark Minarich: (585) 257-6042 or see www.rochesterastronomy.org/calendar-of-events.

ONGOING EVENTS

STRASENBURGH OBSERVATORY

Operations of the Strasenburgh rooftop observatory will resume in April, but there may be last minute exceptions on warm, clear Saturday nights. Contact: Jim Seidewand (585) 703-9876.

OTHER EVENTS

13 Fri: FOSSIL ANTHROPOLOGY AIA RMSC EVENT

5:30 p.m. – 9:30 p.m. Rochester Museum and Science Center (RMSC). Anthropology and Fossil sections are participating with AIA at the RMSC for family night fun at Murray the Mastodon's Birthday. Contact: Karen Wolf (585) 670-9709.

Figure 2: Scolopax minor – American Woodcock. Photocredit: allaboutbirds.org

*Don't forget to **Renew your RAS Membership** for 2020!*
See January Bulletin or rasny.org/mbform .pdf
For the Membership Form.

Rochester Academy of Science
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Return Service Requested

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CHANGING ADDRESS?
Temporary or Permanent?
Notify whallah3@naz.edu.
A returned newsletter costs us 59¢
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ABOUT THE ACADEMY - The Rochester Academy of Science, Inc. is an organization that has been promoting interest in the natural sciences since 1881, with special focus on the western New York state region. Membership is open to anyone with an interest in science. Dues are minimal for the Academy and are listed in the membership application online. Each Section also sets dues to cover Section-related publications and mailings. We are recognized as a 501(c) 3 organization.

For information, contact President Michael Grenier at (585) 671-8738 or by e-mail pres@rasny.org.

The Academy Internet website is http://www.rasny.org Or see us on Facebook at https://www.facebook.com/Rochester-Academy-of-Science-792700687474549**.**

This "**BULLETIN"** is produced monthly, except July and September, by the Astronomy Section, Rochester Academy of Science. Submissions are due by the 10th of the month and may be emailed to: editor@rasny.org.

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