Rochester Academy of Science

BULLETIN

"An organization of people in the Natural Sciences"

February 2021; Vol. 75, #1

President's Message

Last year the decline of North American birds was among the big news in science and in the popular press. Another well-loved group, fireflies, has also been found to be threatened with population decline (pbs.org/wnet/nature/blog/lightning-bugs-at-risk-of-extinction/). A leading researcher in this field is Dr. Sara Lewis of Tufts University. I am pleased to announce that your diligent Vice President Dan Krisher has secured her to be keynote speaker for our Annual Meeting, which will be held on April 13 on Zoom. More details will be in our March edition.

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Our Undergraduate Student Research Grant Review Committee recently selected six students to receive research grants from the Rochester Academy of Science based on the quality of research and presentation. This important RAS program encourages the scientists of the future currently in school, especially after all they have been through this year.

Committee members reviewed and graded these, consulted with each other, and presented a consensus on the awards. Thank you to chairman William Hallahan and members Helen Haller, Tim Tatakis, Karen Wolf, and Michael Richmond for their diligence in completing this.

Each September, Dr. Hallahan sends our Request for Proposals to the sciences faculty at the colleges and universities throughout Upstate NY. The money awarded comes principally from three endowments: the Katherine H. Jensen Memorial Research Grant Fund, the Thomas F. & Annie A. and Grace Murray Memorial Research Grant Funds, the Student Grants Endowment Fund, and member donations made expressly for this program.

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With near continuous Rochester cloud cover from early November to January, I account myself lucky to have viewed the Jupiter-Saturn conjunction two days before maximum closeness. It was still a good show and the advantage in astronomy is that there is always a next good show coming from the universe. All we need is a clear night. Meanwhile we can hike the woods and enjoy the diversity of life.

Michael Grenier, President RAS

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Announcement of the 2020-2021 Undergraduate Student Research Grant Awards

This year, we had 10 proposals, requesting a total of $4,645. Our mission was to award only significant grants rather than small, partial awards. The maximum amount of the grant is $500. The RAS Grants Committee awarded a total of $2316.55 for six research projects.

First place: full funding plus $50 to the student.
Juliana South, University of Rochester. *Attenuation in Granular Materials*. Award: $375.00. Sponsor: Alice Quillen, Ph.D.

Emalee Wrightstone, Rochester Institute of Technology. *The Role of Green Leaf Volatiles and Ethylene on the Maize Rhizosphere Microbiome*. Award: (full funding) $495.00. Sponsor: Eli Borrego, Ph.D.

Daniel Woodford & Andrew Clark, St. John Fisher College. *Investigation into the Localization of Influenza Polymerase PA subunit with Host Protein AIFM1*. Award: (full funding) $273.00. Sponsor: Jonelle Mattiacio, Ph.D.

Alicia Addams, Canisius College. *Novel Verses Constant Scent Lure Methods: an analysis of scent lure effectiveness at camera trapping stations.* Award: $500. Sponsor: Robin Foster, Ph.D.

Lezhi Hao, Cornell Laboratory of Ornithology, Cornell University. *Female plumage traits as signals of mate quality, competitive ability, and stress resilience in the black-throated blue warbler* Award: $400.00. Sponsor: Sara Kaiser, Ph.D.

John Dietsch, Cornell Laboratory of Ornithology, Cornell University. *Effects of artificial light at night on caterpillar predation and parasitism pressures.* Award: $223.55. Sponsor: Sara Kaiser, Ph.D.

Featured Article

Languages of the World, Part 1: Top Languages, Evolution, Taxonomy

By Donald Bridy, RAS Member

There are currently approximately 6500-7000 languages, depending on the exact definition of both separate and living languages (Ethnologue estimates 7117). Top languages in 2020 by total speakers are given in Figures 1a and 1b and on a Map by native speakers alone.

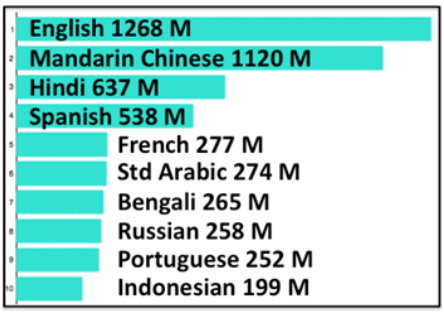

Figure 1a: Top Languages by Total Speakers

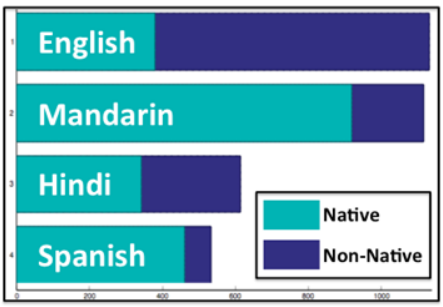

Figure 1b: Top Four Languages by Speaker Type

By total number of speakers English is first, due to its large number of non-native speakers, Mandarin Chinese is second and Hindi is third. By native speakers Mandarin Chinese is first, Spanish is second and English is third.

Just 23 languages account for more than half of the world's population. Approximately 40% of the world's languages are endangered (see map), many with under 1000 speakers. Every year the last speakers of some languages die, and the languages become extinct. In 2019 the UN estimated that 2 indigenous languages were dying every month.

Other languages became extinct because they slowly evolved into different languages. Latin evolved into the Romance languages. Sanskrit became Hindi and others. Old became Middle became Modern English. Estimates from 10,000 BCE to 2200 CE are given in Table 1.

Date	# Languages
10,000 BCE	20,000
1000 CE	9,000
2000 CE	6,500
2100 CE	3,000
2200 CE	100

Table 1: Number of Languages Over Time

Do languages evolve?
Do similarities imply relatedness of languages?

Evolution follows similar patterns in biology and linguistics. Darwin stated, "The formation of different languages and of distinct species, and the proofs that both have been developed through a gradual process, are curiously the same" and again "The survival and preservation of certain favored words in the struggle for existence is natural selection."

Evolutionary biologist Mark Pagel points out that Darwin was right on both counts and goes on to say that linguistic units such as words, phonemes (units of sound) and syntax can be considered as heritable units analogous to genes. A combination of randomness and selection pressures determines language change.

Can we argue from taxonomic resemblance to relatedness? Reasons for similarity of form (and/or function) in biology include:
Common descent – inheritance of genes from a common ancestor.
Convergent evolution – similar traits evolve in unrelated organisms to adapt to similar environments or ecological niches, e.g., birds' and bats' wings.
Horizontal gene transfer – transfer of genetic material between contemporary organisms as opposed to vertical transmission from parent to offspring. It occurs predominantly in microorganisms and is analogous to borrowing in linguistics.
Parallel considerations apply to similarities in languages. These include:
Common descent – inheritance from a common precursor language.
Accidental convergence – similarities in unrelated languages. This is accidental due to the arbitrary sound-meaning correspondence. Possible exceptions include onomatopoetic words (that is, words that themselves resemble the sounds to which they refer), e.g., animal sounds (the sound of a rooster is "cock-a-doodle-doo" in English, "cocorico" in French, "kokekokko" in unrelated Japanese), and some nursery words, e.g., mama ([m] is among the first sounds made and mother is initially the most important person).

Borrowing – transfer of words between languages, often via prolonged close contact. English borrowings from French: parliament, attorney, artillery, beef, diamond; Spanish: armada, canyon, guitar; Sanskrit: avatar; Russian: icon; Japanese: tsunami; Australian: kangaroo. Basic vocabulary (e.g., pronouns, body parts) is more resistant to borrowing.

While the above has concentrated primarily on the lexicon (vocabulary), increased resemblance in morphology (form), phonology (sounds) and syntax (sentence structure/word order) can result from **common descent** and borrowing more generally referred to as **convergence**, which goes beyond simple borrowing of words. A related mechanism is gradual spread of changes (diffusion).

Are The 7000 Languages Related?

In 1786 Sir William Jones, a British jurist in India, remarked upon similarities in both grammatical forms and verbal roots between Sanskrit, Latin and Greek. He

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Languages of the World

Continued from p. 2)

speculated that they arose from a common origin, stating it could also have spawned Celtic, Gothic and Old Persian. This family, termed Indo-European (IE), with 439 living languages, is illustrated in Figure 2, with representative living languages, and in italics some of the extinct languages (some, e.g., Latin and Old Church Slavonic, are still used for liturgical purposes). A few of the IE subfamilies consist of one single living language (Armenian, Albanian).

Proto-Indo-European is the common ancestor. See a family tree, basic information on IE and a map of European IE languages. An example of similarities in Indo-European is given in Table 2. (For simplicity specialized phonetic symbols have been replaced by their closest familiar equivalents).

This approach based on taxonomic similarity, called the comparative method, requires as its final step the working out of sound changes such as Grimm's Law which explains the shift from [p] to [f] in Germanic languages as in the initial consonant of the words for "father", "foot" and many others. Due to language change the comparative method has a temporal horizon often taken to be about 8,000-10,000 years into the past. Within this time horizon reconstruction of some proto-languages has been carried out and one can even find e.g., dictionaries of Proto-Indo-European roots. Note that in addition to the tree model of linguistic evolution there are other models including network and wave models and some even question the concept of a single unified protolanguage.

Of 141 language families listed by Ethnologue, the six largest language families by number of living languages, including IE, account for 63% of all living languages.

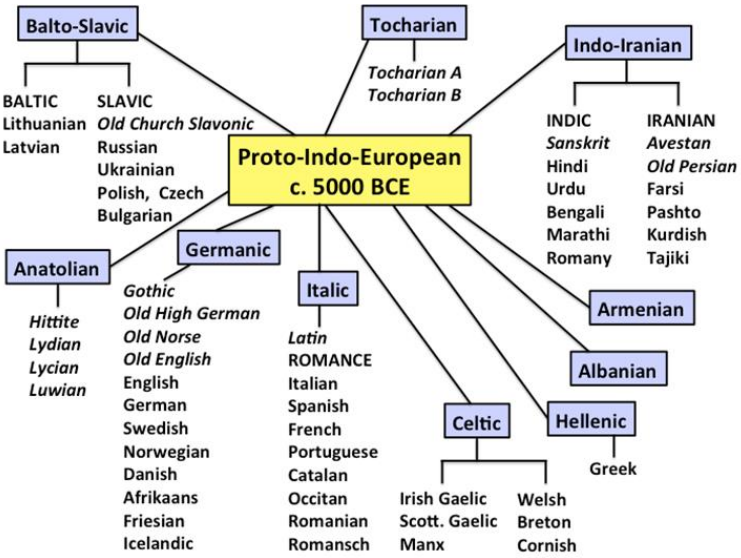

Figure 2: Indo-European Language Family

	I am	he is	father	three
Sanskrit	asmi	asti	pitar	trayas
Latin	sum	est	pater	tres
Greek	eimi	esti	pater	treis
Gothic	im	ist	fathar*	threis

Table 2: Related Words in Four Indo-European Languages
(* sound shift p -> f in Germanic languages – Grimm's Law)

A perennial dichotomy is a single origin (monogenesis) of languages vs. multiple origins (polygenesis). Most linguists believe it is impossible to verify that all known spoken languages are related, due to language change. A minority, the proponents of monogenesis, propose an extremely controversial taxonomy with as few as a dozen or so macro-families which contain all of the world's languages, descending from a single Proto-World language. This result is not accepted as having been demonstrated by most linguists. Some maintain this dichotomy itself is an invalid pseudo-question, asserting it is not well defined, is based on misunderstandings of evolution and language, or cannot be resolved via linguistic data.

Earlier interdisciplinary work on human genetics and language families had shown a high correlation between genetics and language families, taken to indicate a co-evolution of genes and language. A more nuanced picture has been slowly emerging, and results may vary for different aspects of language and different geographic areas.

One study based on compiling and analyzing "the largest available global data set of genotyped samples annotated with language" states "We also find moderate to strong correlations between ancestries and languages at the family or branch levels" (correlation coefficient ranges from 0.52 to 0.96) but points out that the mechanism is uncertain, and it is unclear whether population differences underlie subsequent linguistic differences or language itself acts as a barrier to gene flow. It goes on to state that "Ancestry data yield insight into a deeper past than linguistic data can, while linguistic data provide clarity to ancestry data". This interdisciplinary approach can further refine taxonomies and may partially overcome the time horizon limitations of the comparative method.

Language evolution and relationships represent a fertile area for interdisciplinary research in multiple areas which can include linguistics, genetics, evolutionary studies, cognitive science, archaeology, anthropology, history, complexity theory and computational methods.

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Languages of the World
(Continued from p. 3)

Donald Bridy has a Ph. D. in theoretical physics and worked for GE, Lockheed, Bell Labs, MIT Lincoln Labs. He currently teaches Intro to Cosmology and The Science of Science Fiction.

Figure References:

Figure 1a: Top ten world languages and Figure 1b: Top four languages by speaker type: Number of speakers comes from Ethnologue at https://www.ethnologue.com/guides/ethnologue200

Table 1: Number of Languages Over Time: http://www.sfs.uni-tuebingen.de/~gjaeger/lehre/ws1011/languagesOfTheWorld/folien1.pdf

Figure 2: IE Language Family- modified/redrew with additional figure at

https://www.uottawa.ca/clmc/indo-european-family

Table 3: Related words in 4 Ancient IE Languages combines data from:

An Introduction to the Indo-European Languages, Philip Baldi, Southern Illinois University Press, Carbondale and Edwardsville, 1983.
and

A Dictionary of Selected Synonyms in The Principal Indo-European Languages, University of Chicago Press, Chicago, 1949.

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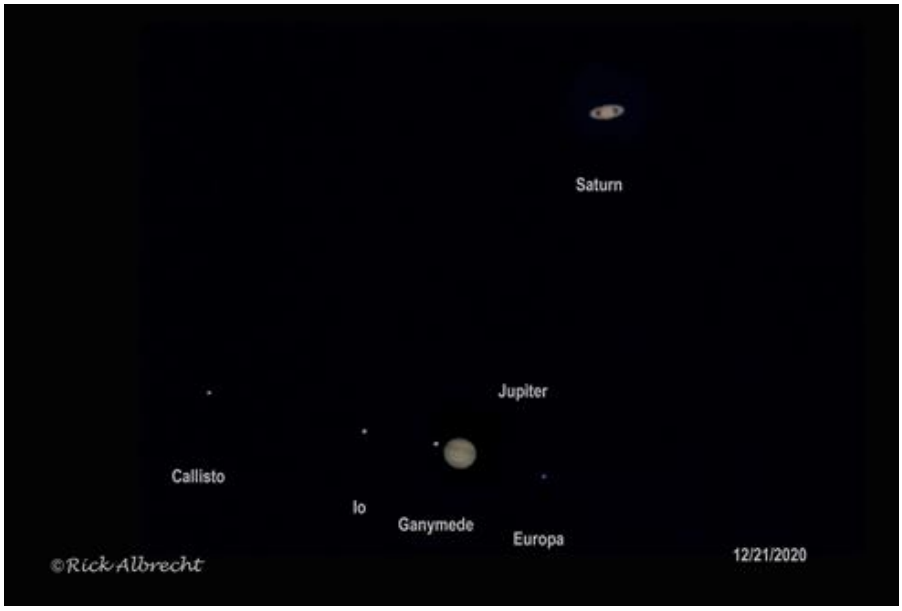
ASRAS Member Astrophotography of the "Great Conjunction" of December by RAS Member Rick Albrecht from Northern Georgia



The new *Proceedings* v 21 of the Academy is available online.

Find it under Publications on https://www.rasny.org/
or
https://nyheritage.org/collections/proceedings-rochester-academy-science.

The latter site allows advanced searches of all our Proceedings. The book contains 471 pages, with the articles composing 37 of these. The articles focus on natural environments in our region: a survey of remnant American chestnut trees in western NY plus an update on that topic, a 15-year report of the frog populations in Mendon Ponds Park, and the climatic zones of western NYS.

The RAS Publications Committee

Citizen Science

Capabilities of the Marian and Max Farash Center for Observational Astronomy

Bob McGovern, RAS Fellow, Former ASRAS Facilities Manager

The following paragraphs describe many of the astronomy activities available to ASRAS members at our observatory campus in Ionia, NY:

Naked eye or binocular observing
The Farash Center's dark skies offer a great opportunity to enjoy our hilltop benches to scan the skies with or without optical aid or to set up your own personal equipment on one of our 7 concrete pads each with its own power source. Equipment may be borrowed from the club for this as well.

Telescopes for viewing purposes
Telescopes are available in apertures of 12",14.5", 16" and 20" with all but the 14.5" instrument housed in its own observatory building. These telescopes require the minimum amount of training and are suited for deep sky, lunar, and planetary observing.

For those wishing to gain experience using computer-controlled telescopes
The club offers a 12" telescope suitable for deep sky, lunar and planetary observing as well as astrophotography. Adapt your DSLR or video camera and enjoy the experience.

Solar observing and imaging
Currently the club's solar observatory can image the Sun in visible light, the light of hydrogen alpha at 656.3 nm and in the light of singly ionized calcium at 393.3 nm. Soon we hope to bring online a second hydrogen alpha instrument with higher resolution. These telescopes can be controlled from a warm room or other remote location in cold weather. The use of these solar instruments requires additional training due to the potential hazards involved with viewing the Sun. This observatory requires special access.

Radio astronomy
This project is a work in progress and is reported on the club's website: http://www.rochesterastronomy.org where you can make the necessary contacts.

A 14" telescope for advanced astrophotography
This telescope can be adapted to image at the focal ratios of f/1.9, f/7 and f/11 from deep sky imaging to higher magnifications for planetary work. It can be controlled from a warm room during the winter months. This equipment requires additional training and building access.

The Ureles observatory for spectroscopic work
This observatory houses a 12" computer-controlled telescope that is currently being evaluated for extending the club's venture into the field of spectroscopy. Please contact the club if you wish to explore this area of astronomy.

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Bob McGovern has been the facilities manager at the Ionia facility since 2005 and has 6 of the 8 structures in Ionia to his credit. Bob is regularly active in Science Camp and Science Club with Carol Latta, as well as with the Scout troop that uses the facility. Bob has coordinated countless work parties.

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Figure 1: A partial view of the grounds of the Marian and Max Farash Center for Observational Astronomy. View from the deck of the Wolk Educational building. *(ASRAS)*

Events for February 2021

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

Not meeting in February: Life Sciences Field Trips, Herbarium Group, Astronomy Star Parties, Strasenburgh Observatory, RAS Winterfest Activities

2 Tue: Fossil Section Meeting

7:30 p.m. The meeting will feature a presentation by Dr. Emily Willoughby, University of Minnesota Twin Cities on "The Science and Art of Paleontological Illustration." Dr. Willoughby is an award-winning artist noted for her illustrations of Mesozoic birds and other dinosaurs. Meeting open to the public via BigBlueButton. To join go to https://meet.exputo.com/b/mar-smx-lap-p7l beginning at 7:00 p.m. Contact Michael Grenier at paleo@frontier.com.

5 Fri: Astronomy Section Meeting

7:30 p.m. Meeting held remotely via BigBlueButton. Speaker: Carol Higgins, NASA Solar System Ambassador, Mohawk Valley Astronomical Society. Topic: The James Webb Space telescope. Meeting details will be shared via email. Contact: Mark Minarich at mminaric@rochester.rr.com.

10 Wed: Astronomy Board Meeting

7:00 p.m. Ionia. Meeting to be held remotely via BigBlueButton. Meeting details will be shared via email. Contact: Mark Minarich at mminaric@rochester.rr.com.

13 Sat: Astronomy Public Open House

12:00 p.m. - 4:00 p.m. (or later, if skies are clear). Observing from dusk till ?. Outdoors only. Observing social distancing and masks as appropriate. Specific rules for bathroom are posted at the facility. Members may bring guests, but all must sign in at Wolk Building to facilitate contact tracing. 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.

16 Tue: Mineral Virtual Meeting

7:00 p.m. ZOOM meeting. Michael Walter will speak about tourmaline collecting in the north country. Members will receive information by email. Contact: J. Dudley at juttasd@aol.com.

17 Wed: RAS Board Meeting

7:00 p.m. Meeting to be held remotely via ZOOM. Meeting details will be shared via email. Contact: Michael Grenier at mgrenier@frontiernet.net.

25 Thu: Anthropology Field Trip

7:30 p.m. Dr. Staci Willis, Houston Community College, will be giving her talk: "Tie It Firmly, Bind It Fast: The Roman-Era Northwestern Adriatic Sewn Boat Tradition." Meeting will be held remotely via ZOOM. Free and open to all members. For a ZOOM invitation, email archaeologyrochester@gmail.com.

2021 Rochester Academy of Science, Inc.

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For your convenience, please pay your dues to the R.A.S. and its sections with a single check. **Make check payable to: Rochester Academy of Science**

CIRCLE the amount you are paying for an Academy category (shaded column) and for the Section(s) in which you wish membership.

Membership Categories *R.A.S. dues are a prerequisite for section membership*	Rochester Academy of Science	Anthropology Section	Astronomy Section	Life Sciences Section	Fossil Section	Mineral Section	**Total**
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Supporting (Individual or family)	$20.00	*****	$40.00	$10.00	$20.00	$10.00	
Patron (Individual or family)	$30.00	*****	$50.00	$20.00	$30.00	$20.00	
Life (Individual only)	$200.00	*****	$300.00	$40.00	*****	*****	
Gift (Thank you!) **Fill in amount ⇨**							
If you are away part of the year, please indicate the months:							

ASRAS Member cellphone photo of the "Great Conjunction" of December by Ken Kressler

Watermelon Tourmaline from Afghanistan
(Bianca Roeske)

Rochester Research in Review

Jan 14, 2021, Cornell, The richer you are, the more likely you'll social distance, study finds

Jan 14, 2021, Syracuse University, Geologic history written in garnet sand

Jan 12, 2021, Cornell, DNA in water used to uncover genes of invasive fish

Jan 11, 2021, University Buffalo, Researchers report quantum-limit-approaching chemical sensing chip

Jan 11, 2021, RIT, Measurements of pulsar acceleration reveal Milky Way's dark side

Jan 11, 2021, Cornell, Understanding origins of Arizona's Sunset Crater eruption of 1,000 years ago

Jan 5, 2021, University Buffalo, Gum disease-causing bacteria borrow growth molecules from neighbors to thrive

Dec 28, 2020, URMC, Vaping could cloud your thoughts, new studies suggest

Dec 21, 2020, UR, How to be happier in 2021

Dec 21, 2020, RIT, Scientists complete yearlong pulsar timing study after reviving dormant radio telescopes

Dec 10, 2020, University Buffalo, Atom-thin transistor uses half the voltage of common semiconductors, boosts current density

Dec 4, 2020, UR, Researchers uncover key clues about the solar system's history

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 paleo@frontier.com.

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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