Rochester Academy of Science

BULLETIN

"An organization of people in the Natural Sciences"

March 2022; Vol. 76, #3

President's Message

The Rochester Academy of Science Annual Meeting & Spring Lecture is Thursday, April 14, 7:15 p.m.

This meeting will be virtual, with directions to be sent with the April Bulletin. After a short introduction, the Board of Directors election will be conducted at the business meeting. A ballot is included on this page and as well as a PDF with the Bulletin distribution to members. Please show us your support by printing and mailing your completed ballot to P.O. Box 92642, Rochester NY 14692-0642. You will also be able to vote at the meeting through the Zoom chat function. **Note that you must have renewed your RAS membership by March 31st**. Although we cannot take email ballots, we will send proxy directions next month.

* * *

The Spring Lecture will follow the business meeting at 7:30PM. We are delighted to have as our guest speaker Dr. John O'Shea. He is Professor of Anthropology at the University of Michigan, Ann Arbor. Dr. O'Shea and his team explored the bottom of Lake Huron looking for evidence of occupation from the terminal Paleoindian and Archaic periods associated with a low water stage (10,000–7,500 years BP).

Exploring a structure at the bottom of Lake Huron (photo credit JM O'Shea)

The team published their first findings in 2009, describing the presence of a series of stone features that match, in form and location, structures used for caribou hunting in both prehistoric and ethnographic times. These were on the Alpena-Amberley Ridge, which was exposed when water levels in Lake Huron were still approximately 100 m (330 ft) below today's levels.

Since 2008, they have discovered at least 60 stone constructions along the submerged ridge that are thought to have been used as hunting blinds by Paleo-Indians when the ridge connected northeast Michigan to southern Ontario and was used as a migration route for large herds of caribou. In 2014 they published on stone drive lane hunting structures they found.

This past year they published on associated obsidian artifacts showing that a trade network brought obsidian from Oregon almost ten thousand years ago to be used for toolmaking. The team's work has been covered in the popular press. He will discuss those findings and other research.

Spring Lecture
Thursday, April 14, 2021

Central Oregon obsidian from a submerged early Holocene archaeological site beneath Lake Huron

Presented by Dr. John O'Shea

More About Our Speaker

Dr. O'Shea is also Curator of Great Lakes Archaeology in the Museum of Anthropological Archaeology. He earned his Ph.D. in Prehistoric Archaeology from Cambridge University in 1978.

See you there!

Michael Grenier, President RAS

ROCHESTER ACADEMY OF SCIENCE
BALLOT FOR JUNE 2022 – MAY 2023 OFFICERS

OFFICE	NAME	√	WRITE-IN CANDIDATE
President:	Michael Grenier		
Vice President:	Daniel Krisher		
Treasurer:	William Hallahan, Ph.D.		
Secretary:	Helen Downs Haller, Ph.D.		
Member, Board of Directors (2022-2025)	Jeff Gutterman, P.E.		
Member, Board of Directors (2022-2025)	Anthony Golumbeck		

Table 1: RAS board of directors ballot

Events for March 2022

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

1 Tue: Fossil Section Meeting
7:30 p.m. Meeting will be held remotely via ZOOM and is open to all RAS Members and guests. *Tyrannosaurus rex* is an iconic dinosaur, with the well-known purported attribute of tiny weak arms. What about that and other tyrannosaurs and theropods? Find out with our distinguished guest Dr. Sara H. Burch, Associate Professor, SUNY Geneseo, speaking on *Forelimb Function in Predatory Dinosaurs*. For meeting details and login info see the FossiLetter or Contact Michael Grenier at paleo@frontier.com.

2 Wed: Astronomy Board Meeting
7:00 p.m. UR Bausch & Lomb Hall, room 480. ASRAS members welcome. Contact: Mark Minarich at mminaric@rochester.rr.com.

4 Fri: Astronomy Members Meeting
7:30 p.m. – 10:00 p.m. RIT Carlson Center for Imaging Science, CAR-1125. Parking Lot F. Meeting will be held in person at RIT as well as virtually via Zoom. Speaker: Don Figer, Ph.D., director of the RIT Center for Detectors, professor in the RIT College of Science. He is a leader in developing and deploying new photon detection technologies. Topic: Infrared detectors on the JWST space telescope. Contact: Mark Minarich at mminaric@rochester.rr.com.

5 Sat: Astronomy Member Observing
Member Observing: Starting from dusk till last person leaves. Messier Marathon. Farash Center for Observational Astronomy, 8355 County Road 14 Ionia, NY 14475. For weather related cancellations or changes contact Mark Minarich at mminaric@rochester.rr.com.

6 Sun: Astronomy Open House
Open House: 12:00 p.m. - 3:00 p.m. Observatory tours and work parties. Sledding if snow. Farash Center for Observational Astronomy, 8355 County Road. For cancellations contact Roger McDonough, site manager, at rdmcdogz@aol.com.

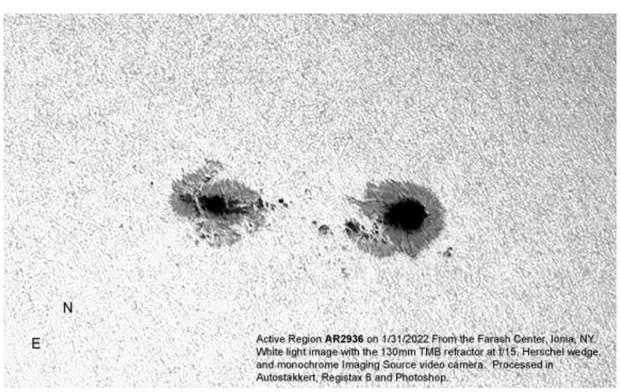
12 Sat: Life Sciences - Herbarium Workshop
10 a.m. – 2 p.m. The Life Sciences section will hold a workshop at the RAS Herbarium, located in the basement of the Rochester Museum and Science Center (RMSC). At RMSC go to the front desk to meet other participants. You must be fully vaccinated, and masks are required for all visitors at RMSC. If you plan to attend, please send RSVP or any inquiries to Elizabeth Pixley, herbarium curator, at eypixley@gmail.com, or call (585) 334-0977.

16 Wed: RAS Board Meeting
7:00 p.m. Virtual meeting using Zoom. For details, contact Michael Grenier at mgrenier@frontiernet.net.

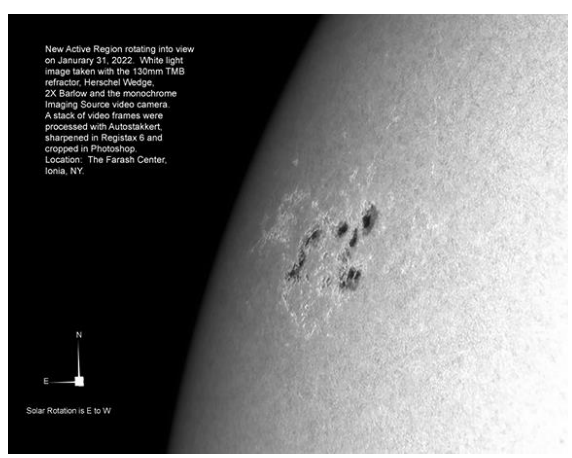
18 Fri: Astronomy Section Winter Lecture
7:30 p.m. RIT Carlson Center for Imaging Science, CAR- 1125. Parking Lot F. Meeting will be held in person at RIT as well as virtually via Zoom. Topic: Member short talks. Contact Mark Minarich at mminaric@rochester.rr.com.

22 Tue: Mineral Virtual Meeting
7:00 p.m. Zoom meeting. Meetings this academic year are held on the 4th Tuesday of the month. At this meeting the past and present climate of Mars will be discussed by Dr. Timothy McConnocie, research scientist with the Space Science Institute and a Participating scientist on NASA 's 2020 Perseverance Rover mission. A link for the meeting will be emailed to members. Guests welcome. Contact: J. Dudley at juttasd@aol.com.

RAS Membership Renewal
Use this temporary link:
https://rochesteracademyofscience.godaddysites.com/how-to-join



Sunspot Active Region R2936 taken on January 1, 2022, from the ASRAS Solar observatory at the Farash Center, Ionia, NY. (Photo credit: Bob McGovern)



New Solar Active Region rotating into view on January 31st, 2022. Taken at the ASRAS Solar observatory at the Farash Center in Ionia, NY. (Photo credit: Bob McGovern)

Featured Article

Blade Patterns Intrinsic to Steel Edged Weapons

Lee A. Jones, M.D., retired Pathologist, Syracuse, New York.

*[Editor's Note: Dr. Jones has had a lifelong scientific passion about historical swords. He is co-author of the text **Swords of the Viking Age** (© Lee A. Jones, Ewart Oakeshott, and Ian G. Peirce, Boydell Press, 2002), as well as host of the Mediæval Sword Resource Site: http://www.vikingsword.com. His materials are used in college anthropology courses, and he analyzes the swords of his own rather large and broad collection using X-Ray Spectroscopy to discover what that methodology can reveal. The result of this project is the subject of a future paper. This article is a reprint from his text, can be found on his website, and will be serialized in subsequent editions of the RAS Bulletin.]*

In examining objects made from modern industrially produced steel little or no texture is readily apparent to the naked eye, even if the objects have been weathered or corroded. Earlier iron and steel artifacts will frequently show a pronounced texture. Such textures may arise from heterogeneous composition and or impurities such as slag stringers that are banished from or tightly regulated in the production of modern steels. Additionally, in the case of antique edged weapons, smiths frequently manipulated naturally occurring textures and or ingeniously joined together dissimilar materials to achieve desired performance and or aesthetic appearance. Whether deliberate or intentional, such patterns often yield clues to how such items were made. This article will show a sampling of such patterns as are found in swords and other edged weapons from a diversity of cultures and times.

In considering the following series of examples it is recommended that the reader consider four admittedly artificial and arbitrary parameters, as each may be present to some extent in many examples. The first will be the natural texture or grain background of the material such as arises from slag inclusions as seen in wrought iron or from natural crystalline structural heterogeneity as in *wootz* (true Damascus) steel. Second will be grain structures that are modified by a bladesmith in layering and folding the raw material back upon itself either a few or many times and whether solely for mechanical benefit or for deliberate aesthetic effect. Third are forging effects and manipulations undertaken by a smith to distort the natural background grain and layering to produce a desired pattern. Important to consider within this parameter for layered structures will be the planes of subsequent stock removal (grinding) and how the angle of intersection of the created surface interacts with the existing grain and layer structure to form a visible surface pattern. Fourth are the further effects obtainable in a blade made up of several components welded together, whether it be merely a piled structure necessary to achieve the desired blade mass and perhaps never intended to be noticed by the customer or a deliberate decoration. The term 'pattern welded' or 'twist core Damascus' is applied to a technique exemplified in Europe by Migration Period and Viking Age swords, but also seen in work from many cultures in Asia. An extreme of this final parameter in the welding together of many components will be exemplified in a chevron-pattern Indian blade.

Natural Grain and Texture – Wrought Iron

The vast majority of pre-industrial iron came from the bloomery process. Prior to the 13th to 14th century, the charcoal-fired furnaces used for the reduction of iron from its ores could rarely attain a sufficient temperature to actually melt iron (and when they accidentally did, the resulting brittle metal mass was useless to the technology of the time). The desired result was a spongy mass of malleable iron termed a 'bloom' that also contained some residual entrapped slag and a greater now separated mass of slag waste including silicates, unreduced ore and other impurities.

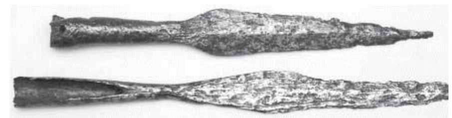


Figure 1: Excavated European early medieval spearheads. These would have been made of bloomery iron and likely subsequently carburized to create a harder steel surface. The slag impurities revealed by corrosion in early steel from direct (never molten) bloomery iron are usually less uniform in size and distribution than in wrought iron made by the later indirect method (molten to cast pig iron which was then decarburized). (Photo credit: Lee A. Jones.)

Composition and quality could vary significantly between batches owing to factors unrecognized or inexplicable at the time. Occasional blooms might naturally include steely areas (where sufficient, but not excessive, carbon was incorporated into the iron). Such material could often be recognized by a smith and reserved for cutting edges. Steel could also be deliberately produced from bloomery iron by subsequent carburization (an increase of carbon largely by diffusion from adjacent carbon rich material) in a charcoal furnace. From the 14th century, with increasing adoption of the blast furnace, purer iron would be produced at higher temperatures by melting iron from the ore to create brittle cast or pig iron. A subsequent process then reduced the high carbon concentration in this material to form wrought iron. Processes discovered by much trial and error augmented by superstitions understandably

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Lee A. Jones
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preceded the gradual scientific understanding of the nature of steel of the past few centuries.

In the processes of fabricating wrought iron into the semi-finished forms supplied by a mill, whether by hammering or rolling, a texture arises as the remaining impurities move along with the metal forming elongated stringers. Etching or corrosion of such material will reveal a 'fibrous' texture analogous to what is seen in sections of wood: cuts parallel to the grain structure will show a straight pattern, curved cuts across the grain will show a complex wood grain-like pattern and cuts perpendicular to the grain structure will show an end grain pattern.

Natural Grain and Texture - Wootz Steel (True Damascus)

Wootz is a particular sub-type of crucible steel originating in India and most famously used in Islamic arms and armor for its attractive surface appearance and an ability to retain a sharp cutting edge. *Wootz* was produced by heating iron ore, charcoal, and vegetable matter in a crucible for a prolonged period of time. This would produce a relatively pure and fairly high carbon steel, indeed sufficiently high carbon that special handling was necessary in forging the blade if fractures were to be avoided. The secrets of *wootz* were long considered lost as a consequence of the disruption of the local traditional Indian production during the British colonial era and only in the last few decades has convincing *wootz* been recreated.

These blades were directly forged from a small cake of this heterogeneous steely iron. J. D. Verhoeven, et. al. (1998) proposed that micro-segregation of carbide-forming trace impurities, particularly vanadium and manganese, in the source ore results in carbide banding. Restrained forging at relatively low temperatures is necessary to preserve and enhance the pattern. Following final grinding the pattern created by this natural heterogeneity of the steel is exposed by mild etching.

Figure 2: Indian katar (jamadhar) of the 18th century with an exceptional wootz pattern; the best work features bold patterns with high contrast such as seen in this example. This wavy pattern of shiny and dark steel is made up of networks showing different metallographic structures (specifically globular cementite in a matrix of pearlite) and extends through the full thickness of the blade, appearing similar at any angle of intersection with the varied surfaces. Foci of a cast crystalline dendritic structure appear to have been retained in this blade indicating very restrained forging and stock removal to create the high central rib and other topographic features. (Photo credit: Lee A. Jones.)

Figure 3: An Arab style saif, early 20th century, mounted with an earlier Persian shamshir blade. The 'watered steel' pattern is typical and reflects a dendritic pattern distorted by forging. (Photo credit: Lee A. Jones.)

Customers for sword blades in the Middle East reputedly particularly valued a type of pattern referred to as *kirk narduban* or the ladder of the Prophet. While many explanations have been put forth in the literature as to how this was most difficult to achieve, such a pattern is, in fact, easily achievable by filing notches into the incomplete blade perpendicular to its length at regular intervals subsequent to a final forging to flatten the surface.

Most crucible steels do not produce such macroscopically visible patterns.

Figure 4: The close-up of this blade shows the kirk narduban (Mohammed's ladder) pattern with several 'rungs' (above arrows) oriented perpendicular to the length of the blade representing an induced alteration in the background pattern. (Photo credit: Lee A. Jones.)

This article will be continued in subsequent editions of the RAS Bulletin.

References:
http://www.vikingsword.com/ethsword/erefs.html

In Memoriam

William F. Coons

July 20, 1931 - November 16, 2021

We sadly note the passing of William F. Coons, RAS Fellow (1979) and long-time Mineral member. Bill joined the Academy in 1968 and quickly became an active participant and volunteer in the activities of the Mineral Section. Over the years he helped plan the annual gem and mineral show, and served as treasurer, program chair, vice president and president. Bill also played important leadership roles on the RAS Board where he contributed as a director, vice president, and president. An avid collector of minerals, Bill graciously donated a large portion of his findings to the Mineral Section's collection in 2020. His last gift to the Academy is greatly appreciated.

2021-2022 Undergraduate Student Research Grant Award Winner

First Report on the Presence of Wolbachia sp. From Freshwater Crayfish Species in the Keuka Lake Watershed

Austin Glazier and Luciana Cursino-Parent Ph.D., Biology Program Director and Associate Professor of Biology, Division of Natural Sciences and Mathematics, Jephson Science Center, Keuka College.

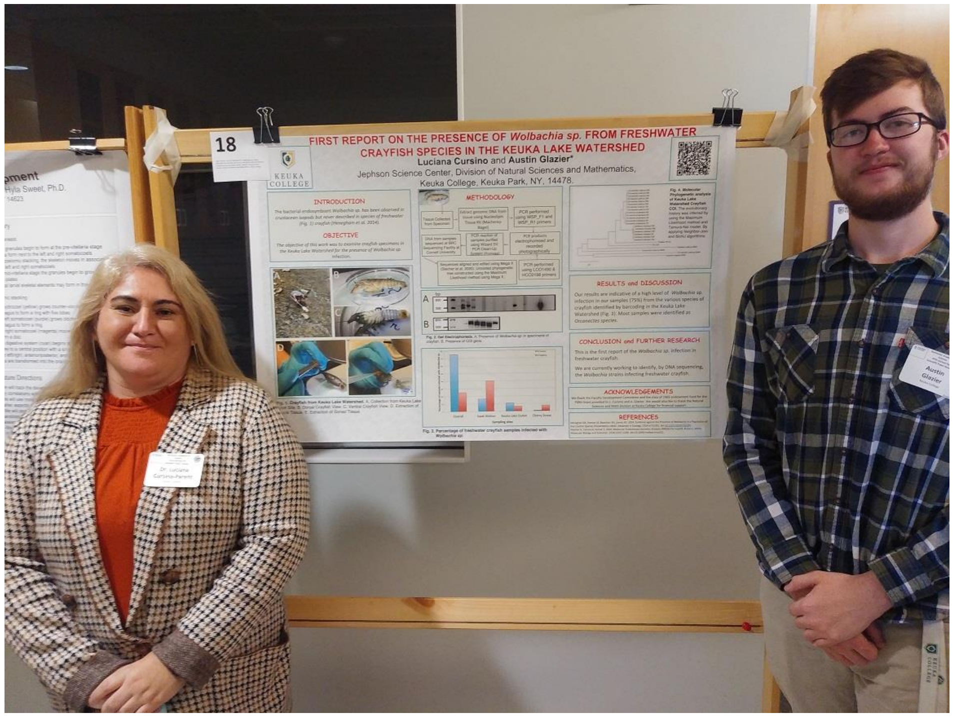
[We thank the Faculty Development Committee and the class of 1965 endowment fund for the FSRA Grant provided to L. Cursino and A. Glazier. We would also like to thank the Natural Sciences and Math Division at Keuka College for financial support.]

Abstract and Introduction

Wolbachia sp. is a common bacterial endosymbiont found in arthropods and isopod crustaceans. Although crayfish are related to Isopods, there has never been an identified positive case of *Wolbachia sp.* in species of crayfish. The goal of this experimental research was to examine species of crayfish in the Keuka Lake Watershed and to identify the presence of *Wolbachia sp.* within their muscle or gonad tissue.

Figure 1: Crayfish from Keuka Lake Watershed. A. Collection from Keuka Lake Outlet Site

Figure 2: Dorsal Crayfish View



Research grant winners and authors Luciana Cursino-Parent, Ph.D., and Austin Glazier in front of their poster at the 47th Annual RAS Fall Paper Session held November 6th at Nazareth College.

Figure 3: Ventral Crayfish View

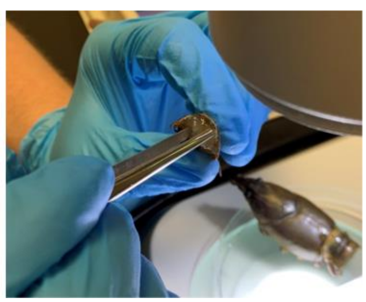


Figure 4: Extraction of Muscle Tissue.

Figure 5: Extraction of Gonad Tissue

By using a sample of tail muscle and gonad tissue from each of 46 crayfish specimens, DNA extraction was performed. Then, endpoint PCR analysis was conducted using the WSP_F1 and WSP_R1 primers to locate and confirm the presence of a conserved Wolbachia-specific-wsp gene. The products of the PCR were analyzed by gel electrophoresis and then prepared for DNA sequencing. Simultaneously, each specimen was barcoded using the COI primers (LCO1490 / HCO2198). The subset of the positive samples was formally submitted for Sanger DNA sequencing of wsp and COI genes. The results of this sequencing were used to create a wsp phylogenetic tree. Our results are indicative of a high level of Wolbachia sp. infection in our samples (75%) from the various species of Crayfish identified by barcoding in the Keuka Lake Watershed. This is the first report of the *Wolbachia sp.* infection in freshwater crayfish.

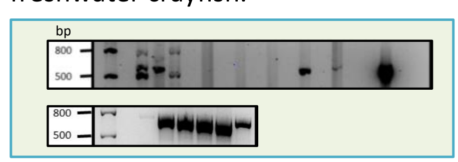


Figure 6: Gel Electrophoresis. A. Presence of Wolbachia sp. in specimens of crayfish. B. Presence of COI gene.

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Austin Glazier and
Luciana Cursino-Parent Ph.D.
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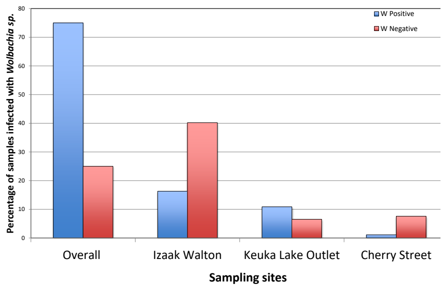

Figure 7: Percentage of freshwater crayfish samples infected with Wolbachia sp.

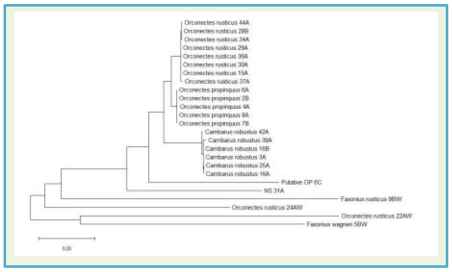

Figure 8: Molecular Phylogenetic analysis of Keuka Lake Watershed Crayfish COI. The evolutionary history was inferred by using the Maximum Likelihood method and Tamura-Nei model. By applying Neighbor-Join and BioNJ algorithms.

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Stecher G, Tamura K, Kumar S. 2020. Molecular Evolutionary Genetics Analysis (MEGA) for macOS. Russo C, editor. Molecular Biology and Evolution. 37(4):1237–1239. doi:10.1093/molbev/msz312.

2021-2022 Undergraduate Student Research Grant Award Winner

Establishing the evolution of Sir3 silencing function in duplicated yeast through ancestral gene reconstruction.

Campbell Vogt, University at Buffalo.

Sponsor: Laura Rusche, Ph.D., Department of Biological Sciences, University at Buffalo.

Abstract

ORC1 and *SIR3* are a pair of paralogs that exist in yeast due to whole genome duplication. Orc1 is the main subunit of a complex that forms at the origin of replication where DNA replication is initiated. Sir3, which is the duplicated version of Orc1, is a nucleosome binding protein that is required for the formation of heterochromatin at telomeres and mating sites. It has been established that Sir3 function is a result of subfunctionalization, as Orc1 participates in silencing in nonduplicated yeast. Sub-functionalization likely occurred via the escape from adaptive conflict (EAC) model, which describes how a gene can optimize its functions following a duplication event. Our lab found that after duplication, Sir3 optimized in one region called the AAA+ base domain. The objective of the proposed project is to identify when in the duplicated yeast lineage Sir3 obtained its optimized silencing capabilities in the AAA+ base domain and which amino acid changes are critical to perform this function. By creating ancestral reconstructions of the AAA+ base domain, it should be possible to characterize the evolution of Sir3 away from Orc1. Ancestral Sir3 protein silencing and expression will be assessed using mating site silencing assays and Western blots.

Background

Sir3 is a protein involved in the regulation of gene expression in yeast. Sir3 binds to nucleosomes, which are DNA-protein complexes that form to compact DNA in the nucleus. As Sir3 binds to the nucleosomes, they are pulled together tightly, forming compact DNA known as heterochromatin. As heterochromatin forms, gene expression is repressed, or silenced [1]. In yeast, Sir3 is required to form heterochromatin over extra copies of mating-type genes. If these genes are not silenced, the cells lose mating-type identity and cannot mate. Sir3 is the duplicated version of Orc1, which is an essential component of a complex that forms at the origin of DNA replication. The duplication event that gave rise to Sir3 was a whole genome duplication (WGD), which is a type of duplication that doubles the entirety of an organism's genetic material. Approximately 100 million years ago, this WGD occurred in yeast, leading to new species within the family *Saccharomycetaceae*, including *Saccharomyces cerevisiae*, the common baker's yeast [2].

Previous research has established that Orc1 participates in silencing at cryptic mating sites in nonduplicated yeast [3] indicates that Sir3 silencing function is a result of subfunctionalization, which is the division of original gene functions between gene copies following duplication [4]. Subfunctionalization likely occurred via escape from adaptive conflict (EAC). EAC is one of two main models that explains subfunctionalization following gene duplication. EAC posits that there is a 'conflict' between functions performed by one protein; each function should be performed with maximum efficiency, but it is not usually possible to improve one function without negatively impacting the other. Once gene duplication makes two copies of the gene available, the functions can be separated and optimize independently [5]. If EAC is the mechanism by which subfunctionalization occurred, silencing function should have been optimized by Sir3 soon after duplication. The goal of the proposed project is to clarify the evolution of Sir3 function optimization away from Orc1 using ancestral gene reconstructions.

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Campbell Vogt

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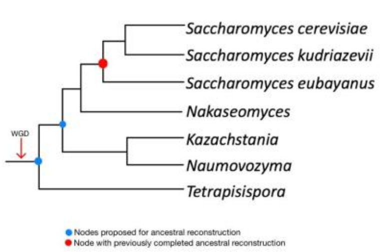
Sir3 and Orc 1 have nearly identical structures, which consist of four domains, including one known as the AAA+ domain. The AAA+ base subdomain is the region of Sir 3 being targeted for ancestral reconstructions. Previous research has identified the AAA+ base region in ORC1 as the region in which changes occurred following duplication [4]. Given this conclusion, it is logical to assume that there has been a specific change that has allowed Sir3 to optimize for silencing in some duplicated yeast We have already found that this change arose early following WGD. It does not exist in *Tetrapisispora*, the earliest diverging genus of duplicated yeast, but it is found in all other duplicated genera [6]. We plan to perform ancestral AAA+ base do main reconstructions at two different nodes within the duplicated yeast lineage one is hypothesized to have silencing function and the other should lack silencing function. The nodes chosen for reconstruction appear soon after genome duplication (see supplemental figure 1 below) The later node should represent the optimization of Sir 3 AAA+ domain structure better fit for silencing, while the earlier node should represent Sir3 AAA+ domain structure that is closer to Orc1 structure and did not acquire the change necessary to perform silencing.



Supplemental Figure 1

Methods

Protein sequence alignments of Sir 3 from available duplicated species (~40) will be done to find the maximum likelihood and AltAll sequences of the AAA+ base domain at two nodes within the duplicated yeast lineage. Alignments and ancestral sequence reconstruction will be done with IQ-TREE software. The maximum likelihood (ML) reconstruction estimates the ancestral sequence by assigning the most likely amino acid at each position within the protein. The AltAll reconstruction creates a protein sequence containing possible alternate amino acids at ambiguous sites Construction of both the maximum likelihood and AltAll sequences allows for greater certainty in ancestral function estimation. If the function s of the ML and AltAll reconstructions are the same, then it is likely that the reconstructions are representative of ancestral function [7]. The identified sequences will be purchased from GenScript, as described in the budget section. Next, an expression plasmid will be constructed, in which the AAA+ base coding region of *Saccharomyces cerevisiae* Sir3 will be replaced with a restriction site. *S. cerevisiae* is a duplicated yeast species and has functional Sir3 silencing [4]. The plasmid will be made using PCR and the NEB Q5 Site Directed Mutagenesis Kit. The reconstructed ancestral sequences will be integrated into the plasmid using the NEB HiFi DNA Assembly Cloning Kit. These new plasmids are expected to produce chimeric Sir3 proteins that have ancestral function in the AAA+ base region. A strain of Sir3 deleted *S. cerevisiae* will be transformed with the edited plasmids. To determine silencing function of the ancestral constructs, a cryptic mating site silencing assay will be used. Mating assays involve combining the transformed yeast cells with other yeast cells of opposite mating type. The assays act as a read out for Sir3 silencing as cells will only mate and grow if they express a single type of mating information, which will only occur if Sir3 has functional silencing capabilities. Western blots will be used to confirm expression of the chimeric Sir 3 proteins in the transformed cells.

Expected Outcomes

Based on the results of this project, it should be possible to establish when the Sir3 AAA+ base domain optimized for silencing function within the duplicated yeast lineage. It is expected that the reconstruction of Sir3 at the earlier node will not have functional silencing, while the reconstruction of Sir3 at the later node should have silencing capabilities. This would mean that Sir3 optimized for silencing soon after WGD, but only after the divergence of *Tetrapisispora*. Additionally, the results may help to identify the characteristics of the AAA+ base amino acid sequence in Sir3 that allows it to better function for silencing and differentiates it from Orc1. Identification of such characteristics may help to explain the inability of Sir3 from some duplicated species to complement an Sir3 deletion in *S. cerevisiae.*

Current Project

Sir3 silencing is currently being established in yeast belonging to the duplicated genus *Kazachstania*. Determining the ability of *Kazachstania* Sir3 proteins to function for silencing in *S. cerevisiae* will provide further insight as to when the AAA+ base domain gained the new property that allowed Sir3 to optimize for silencing. Sir3 silencing in other duplicated genera has already been characterized. An ancestral reconstruction of Sir3 at a recent node in the Saccharomyces clade has already been made, which was able to complement silencing in a Sir3 deleted strain [6]. The project started in September 2021 and should be completed around May 2022.

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Campbell Vogt
(Continued from p.7)

References

[1] Onishi M, Liou GG, Buchburger JR, Walz T, Moazed D. Role of the Conserved Sir3-BAH Domain in Nucleosome Binding and Silent Chromatin Assembly. Molecular Cell. December 2007; 28(6):1015-1028. https://doi.org/10.1016/j.molcel.2007.12.004

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ROCHESTER RESEARCH IN REVIEW

February 17, 2022, University at Buffalo (UB). How motor neurons develop into subtypes that activate different muscles.

February 17, 2022. Cornell University. Reducing negative impacts of Amazon hydropower expansion on people and nature.

February 17, 2022, Cornell. Temperature, reproduction link holds promise for insect control.

February 17, 2022, Rensselaer Polytechnic Institute (RPI). Ancient dwarf galaxy reconstructed with MilkyWay@home volunteer computer.

February 16, 2022. University of Rochester (UR), Can a planet have a mind of its own? Thought experiment.

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February 11, 2022, University of Rochester Medical Center (URMC). New clues in the brain linking pain and food.

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February 7, 2022, Cornell. Jet stream models help inform US offshore wind development.

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February 1, 2022, UR. Moons may yield clues to what makes planets habitable.

January 28, 2022, UB. Nearly 1 in 7 COVID patients in ICU experienced severe bleeding when given full-dose blood thinners, study finds.

January 27, 2022, Cornell. Look who's talking now: The fishes!

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