

# BULLETIN

"An organization of people in the Natural Sciences"



April 2023; Vol. 77, #4

## President's Message

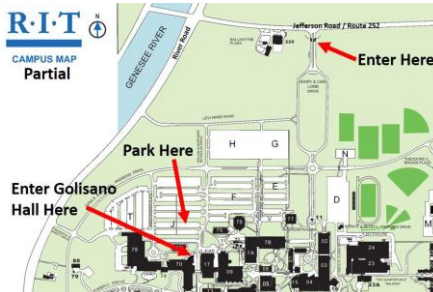
### The Rochester Academy of Science Annual Meeting & Spring Lecture is Wednesday, April 26, 7:15 p.m.

Please join your Academy colleagues for the RAS Annual Meeting and the Spring Lecture on April 26th at the Rochester Institute of Technology's (RIT) Golisano Hall, Room 1400. It will also be available on Zoom. Our meeting will include the election of board members. Details on the meeting and Zoom link can be found at <https://rasny.org/ras-annual-meeting>. Ballot and voting instructions are on the bottom of page 2.

Following the business meeting we have guest speaker Dr. Paul Curtis presenting on "Living with Black Bears in New York State." The free lecture will begin at about 7:30 p.m. and the public is invited to attend. Details about the lecture and the speaker's background can be found in the March Bulletin or at <https://rasny.org/ras-annual-spring-lecture>.

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**Directions to Annual Meeting at RIT**  
RIT is southwest of Rochester at One Lomb Memorial Drive, Rochester, NY 14623-5603, off Jefferson Road. Parking is in Lot J. Golisano Hall is due south of the parking lot. Its entrance is between the CAST engineering building in its front to the right and the Center for Micro-E and Computer Engineering on its left. When you enter Golisano Hall, Room 1400 is an auditorium right there on the first floor.



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### Need Student Grants Chairperson

We need a Volunteer from within the Academy to manage this program on our behalf. The next cycle begins in the Fall and goes through early January 2024. Although we have volunteers who will read and assess applications, we need a person to

oversee the process, update the mailing list, announce the program, receive the applications, and distribute them to the committee. If interested, contact me for more information.

**Michael Grenier, RAS President**

### NOTICE

#### All-Academy Annual Business Meeting

7:15 p.m., Wednesday, April 26, 2023

On Zoom, instructions at

<https://rasny.org/ras-annual-meeting>

Agenda: Welcome, Election, Financial Report, Lecture



## Rochester Academy of Science

### Free Spring Public Lecture

by Dr. Paul D. Curtis

Professor of Wildlife Science in the Department of Natural Resources and Environment at Cornell University



Image courtesy of Dr. Paul Curtis

## Living with Black Bears in New York State

7:30 p.m. □ Wednesday, April 26, 2023

RIT Golisano Hall, Room 1400

[www.rasny.org](http://www.rasny.org) for directions

Meeting of Members at 7:15 p.m.

## Rochester Academy of Science Annual Treasurer's Report for 2022

The Rochester Academy of Science has three categories of funds: the General Fund, the Endowment Funds, and the Expendable Funds. The General Fund receives membership dues and monthly interest from the Life Fund (endowment) and the Memorial Fund (endowment). Expenses from the General Fund are outlined in the budget below. This financial report does not include income and expenses of the individual sections.

### Revenue and Expenses for 2022:

Revenue: Member dues = \$3,687, Gifts \$1272, Interest and dividends = \$4,325. Total revenue = \$ 9,284.

Expenses Summary:

Section & Board Meetings: Room rental*	\$250.00
Bulletin: printing, mailing, labor	1,544.00
General Office Expenses (PO Box, mail permit, & website)	134.00
Liability Insurance	661.00
Website	<u>336.00</u>
Total (excluding transfers)	\$2,925.00

\*Note: all meetings were held via Zoom for 2022. Normally, this would be about \$1625.

**Endowment Funds:** The endowment funds are not spent but generate interest, which is entered as income into the three Expendable Funds. They are reported to the IRS as restricted assets.

Fund	Balance (12/31/2022)	Interest Supports
Fairchild Fund	\$10,741.00	Publications
Life Fund (Life Membership dues)	\$13,300.00	General Fund
Jensen Fund	\$8,275.00	Student Grants
Speakers Fund	\$6,550.00	Lectures
Grace Murray Fund	\$8,250.00	Student Grants
Memorial Fund (named memorial gifts)	\$650.00	General Fund
Grants Program Endowment	\$10,000.00	Student Grants
Herbarium Endowment	\$ 2,000.00	Herbarium
Babette Coleman Bequest	<u>\$ 4,958.86</u>	Herbarium
Balance of the Endowment Funds	\$64,724.86	

**Expendable Funds:** (reported to the IRS as unrestricted assets, each are self-supporting and do not receive funds from membership dues or from the General Fund.)

Publications Fund: used to publish the Proceedings and Academy booklets.

Grants Fund: used to award annual research grants to undergraduate college students. 2022 expenditure was \$2,390.

Lecture Fund: used to pay the expenses and honoraria for invited speakers who give lectures at Academy events (the Fall Scientific Paper Session and the Spring Lecture). 2022 expenditure was \$400.

**Assets and Liabilities:** The assets of the Rochester Academy include money held by each of the five sections, as well as the RAS funds in the Pittsford Federal Credit Union (checking, savings) plus investments held by Morgan Stanley/Smith Barney (which pay about 3%; this monthly interest is deposited into the Expendable Funds accounts). The RAS also owns stock in ConocoPhillips and Phillips 66; the dividends received are deposited into the Grants Fund. Finally, RAS has investment money in the UBS Putnam Diversified Income Trust which was a bequest from the Babette Coleman estate. The RAS also owns the Astronomy Section observatory in Ionia, NY. The RAS has no liabilities.

### ROCHESTER ACADEMY OF SCIENCE BALLOT FOR JUNE 2023 – MAY 2024 OFFICERS

OFFICE	NAME	✓	WRITE-IN CANDIDATE
President:	Michael Grenier		
Vice President:	Jeff Gutterman, P.E.		
Treasurer:	Timothy Tatakis, Ph.D.		
Secretary:	Helen Downs Haller, Ph.D.		
Member, Board of Directors (2023-2026)	Douglas Kostyk		
Member, Board of Directors (2023-2026)	Karen L. Wolf		
Member, Board of Directors (2023-2025)	Theodore Lechman		
Member, Board of Directors (2023-2024)	Daniel Krisher		

Table 1: RAS board of directors ballot

Mail your completed ballot to: RAS, P.O. Box 92642, Rochester NY 14692-0642.

## VOTE!

At the upcoming RAS Annual Meeting and Spring Lecture at 7:15 pm on Wednesday April 26th, 2023, our annual election will be conducted. Please show us your support by voting for your directors and officers. Ballots must be received by April 25th to count.

You will be able to vote in person at the meeting or through the Zoom chat function.

If you have NOT renewed your membership for 2023, you must do so for your vote to count. Visit <https://rasny.org/how-to-join>.

# Events for April 2023

## Not Meeting in April

Anthropology Section

Mineral Section: *see you at the virtual Mineralogical*

*Symposium April 21-23! The annual symposiums have come to a close. See Information in this calendar below.*

## 4 Tue: Fossil Section Meeting

7:00 p.m. **NOTE earlier than usual time.** Meeting will be held in the community meeting room at the NEQALS building, 1030 Jackson Rd., Webster 14580. It will also be broadcast on Zoom and is open to all RAS members and guests. Speakers include member Gerry Kloc of the University of Rochester on *Silurian trilobites collected from Illinois and Missouri* (abstract to follow), and Jonathan Hendricks on the Paleontological Research Institution's planned exhibits and activities in conjunction with their publication of *The Devonian of New York*. All RAS members and visitors are welcome. For meeting details and login info see the [FossilLetter](#) or contact Michael Grenier at [paleo@frontier.com](mailto:paleo@frontier.com).

## 5 Wed: Astronomy Board Meeting

7:00 p.m. Farash Center in Ionia, weather permitting. There will be a Zoom option. ASRAS members are welcome. Contact: Anthony Golumbeck at [semp@use.startmail.com](mailto:semp@use.startmail.com)

## 9 Sun: Astronomy Open House

Open House: 12:00 p.m. - 3:00 p.m. Observatory tours and work parties. Members may bring guests. Come out and learn to use some of the equipment available at the Farash Center! Farash Center for Observational Astronomy, 8355 County Road 14, Ionia, NY 14475. For weather related cancellations or changes contact site manager Roger McDonough at [rdmcdogz@aol.com](mailto:rdmcdogz@aol.com).

## 14 Fri: Astronomy Members Meeting

7:30 p.m. – 10:00 p.m. Liberal Arts (LBR) Hall, RIT, room A-205, Parking Lot F. [At the southwest corner of Eastman Kodak quad](#). Speaker: ASRAS member and NASA ambassador Jim Porter. Contact: Anthony Golumbeck at [semp@use.startmail.com](mailto:semp@use.startmail.com)

## 15, 22 Sat: Astronomy Member Observing: Messier Marathon!

Dusk till? Weather permitting. Watch ASRAS emails for details.

## 19 Wed: RAS Board Meeting

7:00 p.m. – 9:00 p.m. at Church of the Ascension. Zoom option available. For details, contact Michael Grenier at [mgrenier@frontiernet.net](mailto:mgrenier@frontiernet.net).

## 19 Wed: Life Sciences - Herbarium Workshop

1:00 p.m. – 4:00 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. If you plan to attend, please send RSVP or any inquiries to

Elizabeth Pixley, herbarium curator, at [eypixley@gmail.com](mailto:eypixley@gmail.com), or call (585) 334-0977.

## 21 Fri – 23 Sun: Virtual Rochester Mineralogical Symposium

Free. Online. Registration required: go to <https://rasny.org/mineral-section>. Attend any number of sessions over the weekend and enjoy "What's New in Minerals," special lectures, and short talks. Opening act is 8 pm Friday with a talk about the Sudbury Basin, a metal rich impact site. A schedule is posted on the [Mineral Section web page](#). Last session at noon on Sunday celebrates 50 years of RMS. Sadly, 2023 marks the final Symposium as there are no plans to continue. For registration help contact Carl Miller at [contactrms@hotmail.com](mailto:contactrms@hotmail.com). For general questions contact Jutta Dudley at [juttasd@aol.com](mailto:juttasd@aol.com).

## 27 Thu: Astronomy Forum

7:30 p.m. Zoom only. Come and share your personal astronomical experiences or interests. The Zoom link is <https://rochester.zoom.us/j/95477169573> Contact Carol Latta at [cosmos@rochester.rr.com](mailto:cosmos@rochester.rr.com).



Photo of Moon taken March 28, 2023. Central crater looks like it has terraced walls, but it turns out it is a crater within a crater (near center). It is called [Boussingault](#). It is near the lunar south pole. It is not always visible - [lunar libration](#) sometimes places it over the horizon. (Photo Credit: Kevin Lyons, ASRAS Member)

## RAS 2022 Fall Poster Paper Session

Huayuan Han, [Dr. Sheth Nyibule](#),  
Pete Miller, Department of Physics  
and Astronomy, Rochester Institute of  
Technology

*Heavy-Ion Fusion Cross Section of  
Tightly Bound Doubly Magic Ca40  
on Different Ca Targets.*

### Abstract

The total fusion-cross-sections for the fusion of tightly bound doubly magic Ca40 on different Ca targets at incident energies near the Coulomb barrier are calculated using one dimensional penetration model. The total interaction potential is taken as a sum of Coulomb and Wood-Saxon form of nuclear potential. Calculated fusion cross-section are compared with experimental data.

### Introduction

Heavy Ion is defined as a nucleus with mass number  $A > 4$ . Heavy-ion reaction, therefore, involves entrance channel participants, the target, and the projectile, with  $A > 4$ . Research efforts on topics such as fusion barriers and fusion cross-sections have been made both theoretically and experimentally. Such studies are based on the behavior of two colliding nuclei around the Coulomb barrier. The Coulomb barrier energy is formed by the Coulomb repulsion force and nuclear attraction force. These barrier energies are heavily influenced by the structure and collision parameters of two nuclei. In this study, fusion cross-sections for the fusion of tightly bound doubly magic Ca40 on different Ca isotopes are investigated to explore the role of neutron richness in fusion cross-sections.

### Entrance Channel Asymmetry

$$\eta = \frac{N - Z}{A}$$

where  $N = N_p + N_t$ ,  $Z = Z_p + Z_t$ ,  
 $A = A_p + A_t$ ,  $N$  = neutron number,  $Z$  =  
proton number, and  $A$  = mass number of  
fusing system.

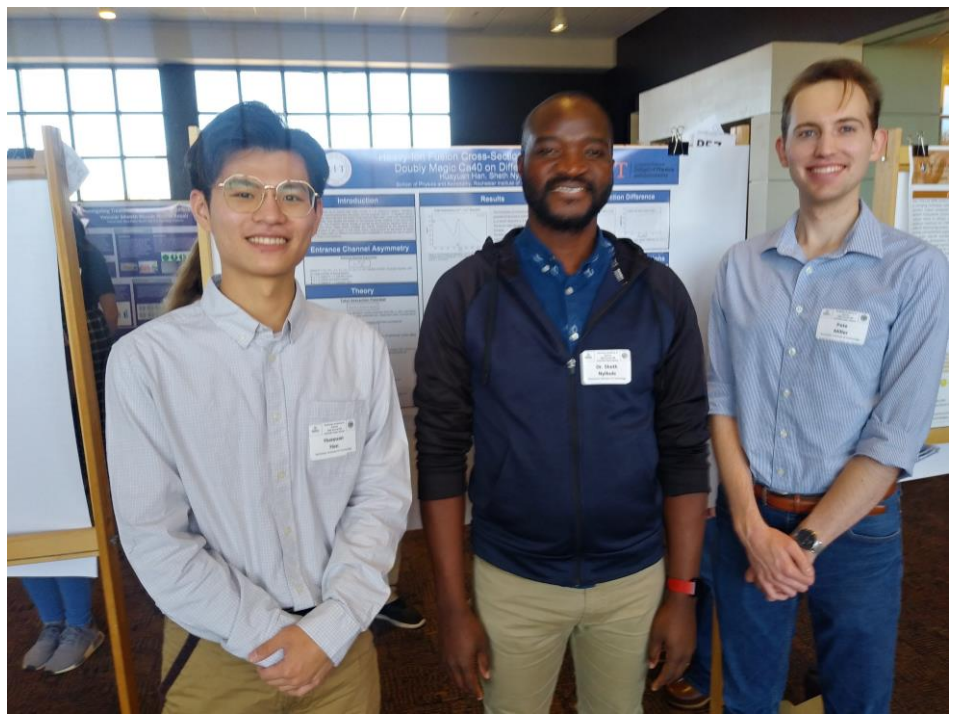


Figure 1: Huayuan Han, [Dr. Sheth Nyibule](#), and Pete Miller of RIT at the October 29, 2022, RAS Paper Session at the Rochester Museum and Science Center. (Photo credit: RAS Bulletin Editor)

$\eta < 0$  means  $N < Z$  (neutron poor)

$\eta = 0$  means symmetric system

$\eta > 0$  means  $N > Z$  (neutron rich)

### Theory

#### Total Interaction Potential

$$V_T(r) = V_C(r) + V_N(r)$$

The  $V_N$  term represent short-range attractive nuclear potential while the  $V_C$  term represents long-range repulsive Coulomb potential. Both potentials are  $r$  dependent which corresponds to inter-nuclei distance.

The type of nuclear potential we adopt is the Wood-Saxon Potential expressed as

$$V_N(r) = -\frac{V_0}{[1 + e^{\frac{r-R}{a}}]}$$

where  $V_0$  is defined as the depth of potential well ( $V_0 = 40\text{MeV}$ ),  $R$  represents nuclear radius and is given by

$$R(A_t, A_p) = 1.25 (A_t^{\frac{1}{3}} + A_p^{\frac{1}{3}})$$

$a$  represents nuclear skin thickness ( $a \approx 0.5\text{ fm}$ ). In addition to the nuclear term, there is a Coulomb potential term that contributes to the total interaction potential expressed as

$$V_C(r) = \begin{cases} \frac{e^2 Z_p Z_t}{r}, & r > R \\ \frac{e^2 Z_p Z_t}{2R} [3 - (\frac{r}{R})^2], & r < R \end{cases}$$

### Fusion Cross Section

For energies near the Coulomb barrier, the total fusion cross-section given by

$$\sigma = \frac{\pi}{k^2} \sum_{l=0}^{\infty} (2l + 1) T_l$$

where  $T_l$  is probability of transmission of the  $l_{th}$  partial wave. In the region of  $l \approx 0$

$$\sigma = \frac{R_B^2 \hbar \omega_0}{2E_{cm}} \ln(1 + \exp[\frac{2\pi(E_{cm} - V_B)}{\hbar \omega_B}])$$

### Results

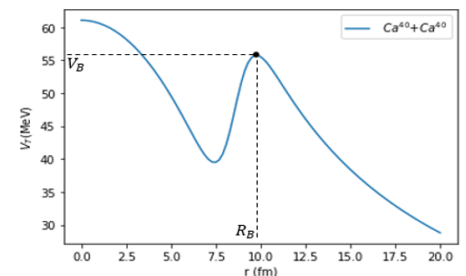


Figure 2: Total Interaction Potential for  $Ca^{40} + Ca^{40}$  Reaction. Coulomb barrier is formed at  $r \approx 9.743\text{ fm}$  where the barrier height is at  $V_B \approx 54.346\text{ MeV}$

(Continued from p.3)

The combination of Coulomb potential and Wood-Saxon potential formed a barrier potential.

$R_B$  is barrier radius and  $V_B$  is barrier height.

The barrier height decreases as target neutron number ( $N_t$ ) increases.

The barrier radius increases as target neutron number increases.

### Fusion Cross Section

Calculated fusion cross-sections compared to experimental data:

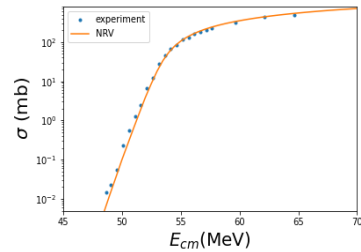


Figure 3: Experimental data of  $Ca^{40} + Ca^{40}$  fusion cross-section is compared with the calculated fusion cross-section.

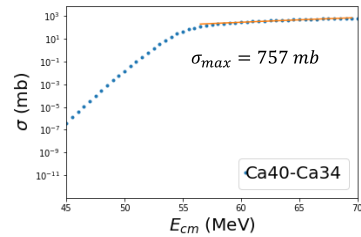


Figure 4a: Fusion cross sections for most neutron-rich reactions.

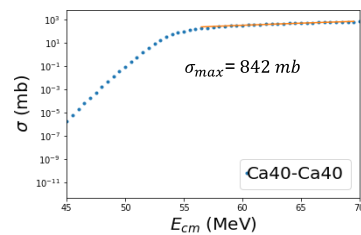


Figure 4b: Fusion cross sections for most neutron-poor reactions.

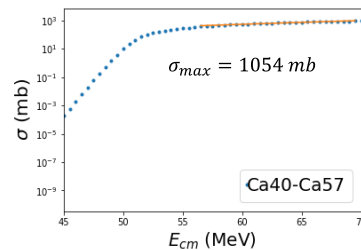


Figure 4c: Fusion cross sections for most symmetric reactions.

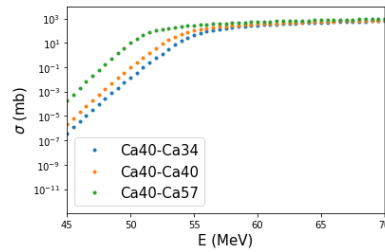


Figure 5: Fusion cross-section of symmetric reaction with asymmetric reactions.

### Cross-Section Difference

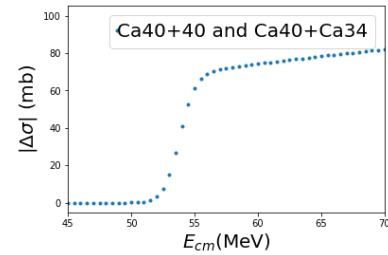


Figure 6a: Cross-section difference for  $Ca^{40} + Ca^{40}$  and  $Ca^{40} + Ca^{34}$ .

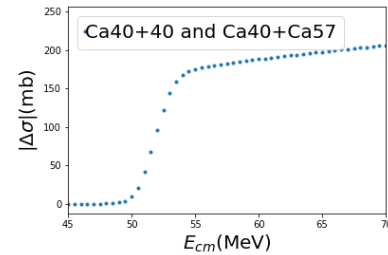


Figure 6b: Cross Section difference for  $Ca^{40} + Ca^{40}$  and  $Ca^{40} + Ca^{57}$ .

### Conclusions and Future Directions

Fusion cross-section increases with increasing neutron richness of the fusing system.

Fusion cross-sections calculated via NRV agrees with experimental data reasonably well.

The differences between cross-sections show a sharp increase near the Coulomb barrier.

Our future goal will be studying different nuclear fusion models such as proximity potential and to explore the sensitivity of fusion cross-section to the model parameters.

### References

- Ishwar Dutt and Rajeev K.Puri, *Phys. Rev C* 81 (2010) 044615
- R.Gharaei, V.Zanganeh, N.Wang. *Nuclear Phys A* 979 (2018) 237-250
- Tapan Rajbongshi, Kushal Kalita. *Cent. Cur. J. Phys* 12(6) (2014) 433-444
- National Nuclear Data Center, Brookhaven National Laboratory, T.W.Burrows.

Atomic Mass Data Center (Orsay), G.Audi, A.H.Wapstra, *Nucl.Phys.*, A595 (1995), 409; *ibid.* A624 (1997), 1.

G. Montagnoli, A.M. Stefanini, C.L. Jiang et al., *Physical Review*, C 85 (2012) 24607

### Acknowledgements

Huayuan Han would like to thank Dr.Nyibule for guiding me throughout this project, and thanks to the RIT community for their wonderful support.

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### Fusion Energy Funding Partnership Call for Proposals

Enter the Fusion Manufacturing Challenge by April 21.



Commonwealth Fusion Systems and UK Atomic Energy Authority want to hear from you! Share your solution; enter the Challenge by April 21 to work with them and transform energy on our planet. You might be a perfect fit if your solution is a...

*Bonding technology that addresses dissimilar thermal expansion across material boundaries and whose joints are safe under high degree of vacuum.*

*Non-destructive testing approach that is suitable for specialized alloys and can identify and quantify flaws in bonds between first wall and structural materials.*

Finalists will pitch on June 20 at [TechConnect World Innovation Conference](#) in Washington, D.C. to experts from both sponsoring organizations for a chance to work with them to advance fusion solutions.

### Submit your abstract.

Entries due by April 19.

Submitted by Jeff Gutterman, P.E., RAS Director

*Mating Behavior in Mutant C. elegans.*

**Abstract**

Primary cilia are used by some organisms to provide sensory input. During mating, male *C. elegans* sense the hermaphrodite's vulva with ciliated neurons embedded in the fan of their tail. To understand how certain mutants impact male mating on *C. elegans*, we analyzed mating behavior. The results demonstrate that loss of *klp-13*, a kinesin-like motor, or *tba-5*, a tubulin, does not have an impact on male mating behavior, but loss of *rff-3*, an RNA-dependent RNA polymerase, does impair mating. These results further our understanding of the role of RNA metabolism on mating behavior in nematodes and ciliopathies in humans.

**Introduction**

An organism's survival depends on the ability to sense and respond to their environment. For eukaryotic organisms to sense and understand their environment, they require the organelle cilia to be present. Cilia are important for receiving signals of a chemical and mechanical nature for regulation and differentiation. Many of the cilia genes required for the formation, maintenance, and function of *C. elegans* have human counterparts. The cilia found in human kidneys for urine detection is the same cilia that develop in *C. elegans* male tail for mating.

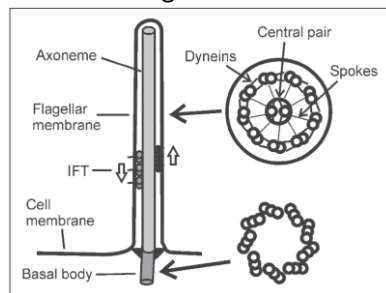


Figure 2

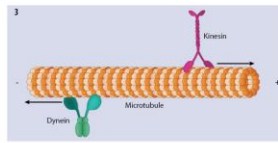
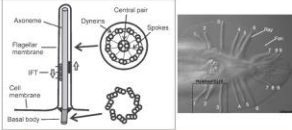
**Mating Behavior in Mutant *C. elegans***  
Kristina Wilson and Dr. Daryl Hurd

**Abstract**

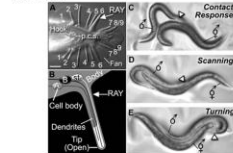
Primary cilia are used by some organisms to provide sensory input. During mating, male *C. elegans* sense the hermaphrodite's vulva with ciliated neurons embedded in the fan of their tail. To understand how certain mutants impact male mating on *C. elegans*, we analyzed mating behavior. The results demonstrate that loss of *klp-13*, a kinesin-like motor, or *tba-5*, a tubulin, does not have an impact on male mating behavior, but loss of *rff-3*, an RNA-dependent RNA polymerase, does impair mating. These results further our understanding of the role of RNA metabolism on mating behavior in nematodes and ciliopathies in humans.

**Introduction**

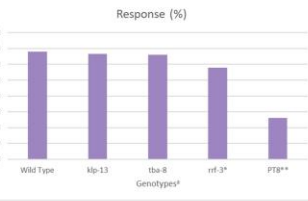
For an organism's survival, it depends on the ability to sense and respond to their environment. For eukaryotic organisms to sense and understand their environment, they require the organelle cilia to be present. Cilia are important for receiving signals of chemical and mechanical nature for regulation and differentiation. Many of the cilia genes required for the formation, maintenance, and function of *C. elegans* have human counterparts. The cilia found in human kidneys for urine detection is the same cilia that develop in *C. elegans* male tail for mating.



**Method**



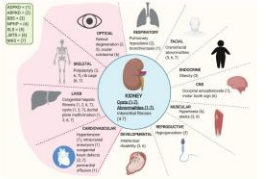
For each type of worm, 50 worms were observed with standard mating protocol.



**Results:**  
Wild Type:  $X^2=6.48, 0.025 > p > 0.01$ , number of contacts > number of no contacts  
*klp-13*:  $X^2=6, 0.025 > p > 0.01$ , number of contacts > number of no contacts  
*tba-8*:  $X^2=5.453, 0.025 > p > 0.01$ , number of contacts > number of no contacts  
*rrf-3*:  $X^2=1.28, p > 0.1$ , number of contacts = number of no contacts  
PT8:  $X^2=11.52, p < 0.01$ , number of contacts < number of no contacts

**Justification**

When cilia are disrupted, it creates a ciliopathy with painful consequences for the person. These cilia are homologous to the cilia within *C. elegans*' sensory neurons. These sensory neurons are required in mating as the cilia allows the male to locate the vulva of the hermaphrodite.



**Conclusion**

As the mutant genotypes *klp-13* and *tba-8* p-value is greater than 0.025 and less than 0.01, there is presumed to be no connection between the phenotype of defective mating and the loss of the state gene. However, *rrf-3* had a p-value which was greater than 0.1 which suggests the number of contacts is equal to the number of no contacts. This suggests that *rrf-3* may be involved in the phenotype of mating.

Figure 1: Kristina Wilson and Dr. Daryl Hurd of St. John Fisher College's poster at the October 29, 2022, RAS Paper Session at the Rochester Museum and Science Center.

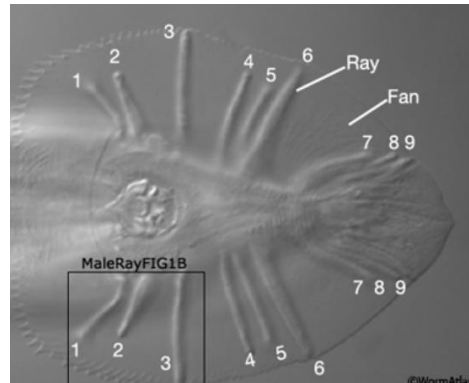


Figure 3

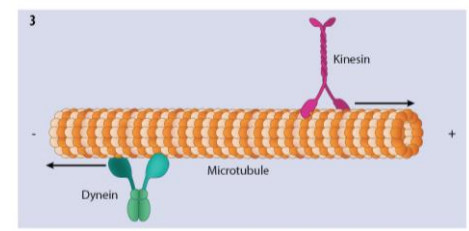


Figure 4

**Method**

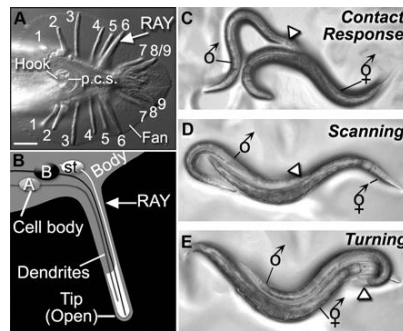


Figure 5

For each type of worm, 50 worms were observed with standard mating protocol.

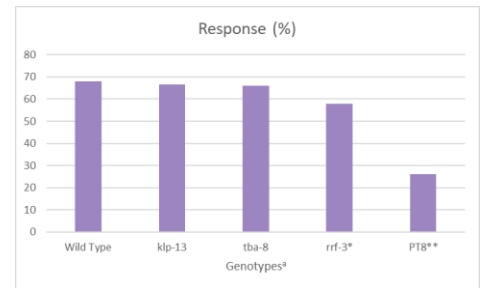


Figure 6

**Results**

Wild Type:  $X^2=6.48, 0.025 > p > 0.01$ , number of contacts > number of no contacts  
*klp-13*:  $X^2=6, 0.025 > p > 0.01$ , number of contacts > number of no contacts  
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*rrf-3*:  $X^2=1.28, p > 0.1$ , number of contacts = number of no contacts  
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**Justification**

When cilia are disrupted, it creates a ciliopathy with painful consequences for the person. These cilia are homologous to the cilia within *C. elegans*' sensory neurons. These

(Continued on p. 7)

(Continued from p. 6)

sensory neurons are required in mating as the cilia allows the male to locate the vulva of the hermaphrodite.

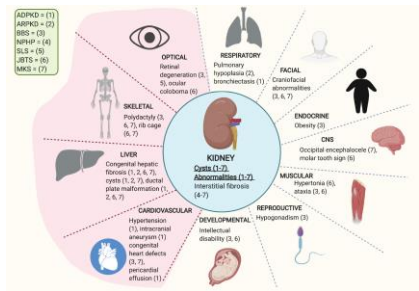


Figure 7

### Conclusion

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### References

Herndon, L. A. (2013). NEURONAL SUPPORT CELLS OF THE MALE SENSILLA - RAYS. WormAtlas. Retrieved October 10, 2022, from <https://www.wormatlas.org/male/rays/Rayframeset.html>

Hurd, D. D., Miller, R. M., Núñez Lizbeth, & Portman, D. S. (2010). Specific  $\alpha$ - and  $\beta$ -tubulin isoforms optimize the functions of sensory cilia in *Caenorhabditis elegans*. *Genetics*, 185(3), 883–896. <https://doi.org/10.1534/genetics.110.116996>

*klp-13* (gene) - WormBase : Nematode Information Resource. wormbase.org. [accessed 2022 Apr 4]. [https://wormbase.org/species/c\\_elegans/gene/WBGene00002224#0-9f17dh2cb-10](https://wormbase.org/species/c_elegans/gene/WBGene00002224#0-9f17dh2cb-10).

Koo, P. K., Bian, X., Sherlekar, A. L., Bunkers, M. R., & Lints, R. (2011). The robustness of *Caenorhabditis elegans* male mating behavior depends on the distributed properties of Ray sensory neurons and their output through core and male-specific targets. *Journal of Neuroscience*, 31(20), 7497–7510. <https://doi.org/10.1523/jneurosci.6153-10.2011>

Lipton J. 2005. Mating worms and the cystic kidney: *Caenorhabditis elegans* as a model for renal disease. *Pediatric Nephrology*. 20(11):1531–1536. [doi:10.1007/s00467-005-1958-x](https://doi.org/10.1007/s00467-005-1958-x).

McConnachie, D. J., Stow, J. L., & Mallett, A. J. (2021). Ciliopathies and the kidney: A Review. *American Journal of Kidney Diseases*, 77(3), 410–419. <https://doi.org/10.1053/j.ajkd.2020.08.012>

Mitchell, D. R. (2007). The evolution of eukaryotic cilia and flagella as motile and sensory organelles. *Advances in Experimental Medicine and Biology*, 130–140. [https://doi.org/10.1007/978-0-387-74021-8\\_11](https://doi.org/10.1007/978-0-387-74021-8_11)

O’Hagan R, Wang J, Barr MM. 2014. Mating behavior, male sensory cilia, and polycystins in *Caenorhabditis elegans*. *Seminars in Cell & Developmental Biology*. 33:25–33. [doi:10.1016/j.semcdb.2014.06.001](https://doi.org/10.1016/j.semcdb.2014.06.001).

*rrf-3* (gene) - WormBase : Nematode Information Resource. wormbase.org. [accessed 2022 Apr 4]. [https://wormbase.org/species/c\\_elegans/gene/WBGene00004510#0-9f17dh2cb-10](https://wormbase.org/species/c_elegans/gene/WBGene00004510#0-9f17dh2cb-10).

*tba-8* (gene) - WormBase : Nematode Information Resource. wormbase.org. [accessed 2022 Apr 4]. [https://wormbase.org/species/c\\_elegans/gene/WBGene00006534#0-9f17dh2cb-10](https://wormbase.org/species/c_elegans/gene/WBGene00006534#0-9f17dh2cb-10).

What are microtubules? MBInfo. (2018, February 6). Retrieved October 10, 2022, from <https://www.mechanobio.info/cytoskeleton-dynamics/what-is-the-cytoskeleton/what-are-microtubules/>

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### RAS 2022 Fall Poster Paper Session

[Olivia Young](#) and [Dr. Michael T. Lam](#). Rochester Institute of Technology.

#### [CLEAN Deconvolution](#) of Radio Pulsar Pulses.

[Editor’s note: Dr. Lam’s students presented TWO posters at the 2022 RAS Paper session. The first was described in the March 2023 issue of the RAS Bulletin. This is the second poster.]

#### Abstract

Broadband radio waves emitted from pulsars are distorted and delayed as they propagate toward Earth due to interactions with the free electrons that comprise the interstellar medium (ISM). Irregularities in the ISM cause multipath propagation of the wavefronts along the line of sight toward Earth, with lower radio frequencies being more greatly impacted than higher frequencies. These delays result in later times of



Dr. Michael T. Lam (right) and Olivia Young (second from left) with students at the October 29, 2022, RAS Paper Session at the Rochester Museum and Science Center.

arrival for the lower frequencies and cause the observed pulse to arrive with a broadened tail described via the pulse broadening function. We employ the CLEAN deconvolution

technique to recover both the intrinsic pulse shape and pulse broadening function. This work expands upon

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## ROCHESTER AREA RESEARCH IN REVIEW

(Continued from p. 7)

previous descriptions of CLEAN deconvolution used in pulse broadening analyses by parameterizing the efficacy on simulated data and developing a suite of tests to establish which of a set of figures of merit lead to an automatic and consistent determination of the scattering timescale. In this poster, we compare our algorithm to simulations performed on cyclic spectroscopy estimates of the scattering timescale and present results of testing our improved algorithm on the highly scattered millisecond pulsar J1903+0327.

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### Amateur Pulsar Detection?

**Why not! Some links:**

[\(SARA\) Society of Amateur Radio Astronomers: Exploring Pulsar Timing Residuals](#)

[SARA B0329+54 with 1.9 meter dish Pulsar Detection using the RTL2832U DVB-T](#)

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[A Lab to Detect Radio Pulsars Using a Remotely Accessed 18-Meter Radio telescope](#)

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