UNSEEN ADVANTAGE

THE ALTERNATE PERSPECTIVE OF A BLIND COMPUTATIONAL CHEMIST

ABOUT ME

I went to Wellesley College for my undergraduate studies. I majored in Middle-Eastern Studies and Chemistry.

Now, I am a postdoctoral researcher at the University of Minnesota.

For my graduate thesis, I studied *Helicobacter pylori* urease at the University of Florida.

A HISTORY

STANDING ON THE SHOULDERS OF GIANTS

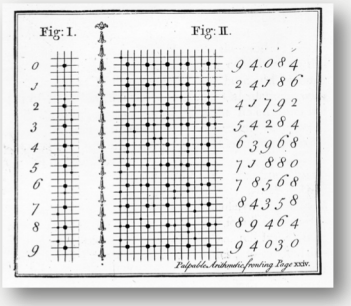
HISTORY: FOREBEARERS

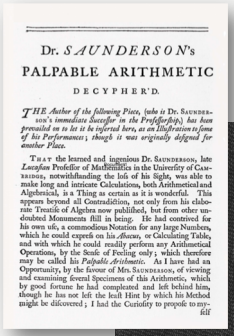
Nicholas Saunderson (right) was a blind mathematician and scholar. He invented his own way to do computations, which he called "palpable arithmetic."

At Cambridge, Saunderson's work was highly respected, and his lectures were very popular.

Smithsonian Institution Libraries/Science Source

J J Tattersall, Nicholas Saunderson : the blind Lucasian Professor, *Historia Math*. **19 (4)** (1992), 356-370.

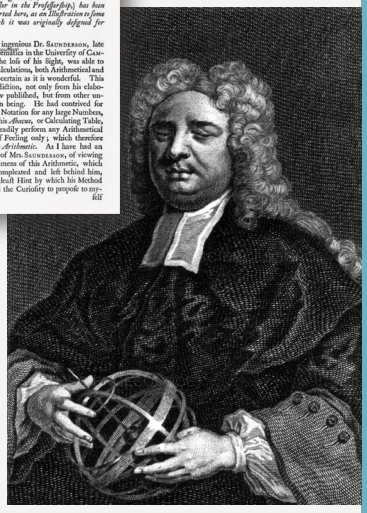




Dr. *SAUNDERSON's*
PALPABLE ARITHMETIC
DECYPHER'D.

THE Author of the following Piece, (who is Dr. Saunderson's *immediate Successor in the Professorship) has been prevailed on to let it be inserted here, as an Illustration to some of his Performances; though it was originally designed for another Place.*

THAT the learned and ingenious Dr. SAUNDERSON, late *Lucasian* Professor of Mathematicks in the University of Cambridge, notwithstanding the loss of his sight, was able to make long and intricate Calculations, both Arithmetical and Algebraical, is a Thing as certain as it is wonderful. This appears beyond all Contradiction, not only from his elaborate Treatise of Algebra now published, but from other undoubted Monuments still in being. He had contrived for his own use, a commodious Notation for any large Numbers, which he could express on his *Abacus*, or Calculating Table, and with which he could readily perform any Arithmetical Operations, by the Sense of Feeling only; which therefore may be called his *Palpable Arithmetic*. As I have had an Opportunity, by the favour of Mrs. SAUNDERSON, of viewing and examining several Specimens of this Arithmetic, which by good fortune he had completed and left behind him, though he has not left the least Hint by which his Method might be discovered; I had the Curiosity to propose to myself



According to those who studied under him, Saunderson's "palpable arithmetic" method was also extremely helpful for writing his influential treatises on algebra.

BLIND CHEMISTRY

VISION IS MORE THAN SIGHT

BLIND CHEMISTRY: HOW WE ARE TAUGHT

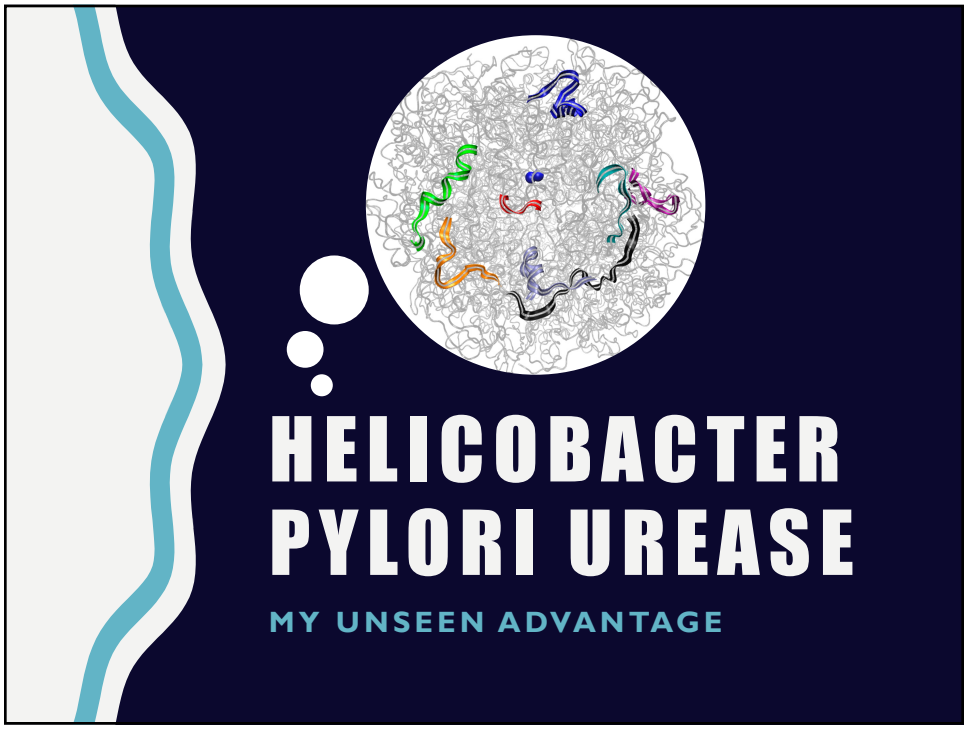
Science is still taught primarily through visual methods.

While these methods are tried and effective, many alternative methods bring new potential and extraordinary success to not only to blind and disabled scientists, but also to the field as a whole.

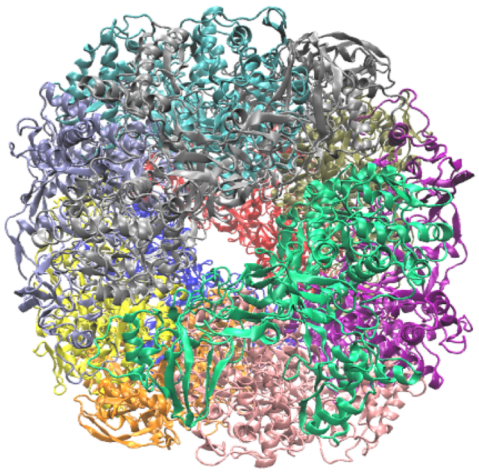
BLIND CHEMISTRY: NEW METHODS

Dr. Wanda Diaz-Merced is a blind astronomer. She pioneered an approach to "listen to the stars" by turning star data into sound.

Dr. Diaz-Merced's star sonification and Dr. Saunderson's palpable arithmetic are just two examples of many unique perspectives and ideas to add to the scientific toolbox.



Helicobacter pylori Urease



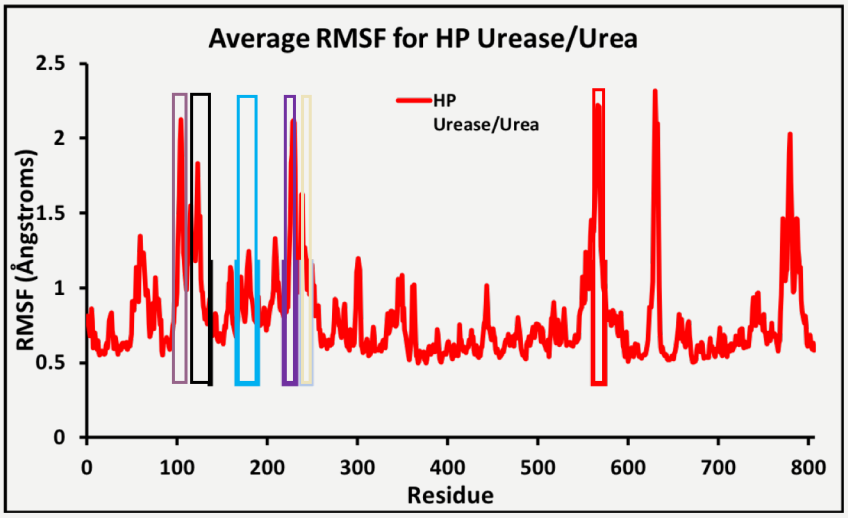
PDB ID: 1E9Z
[3Å Resolution]

Homotetramer of homotrimers of heterodimer 4(3(ab))

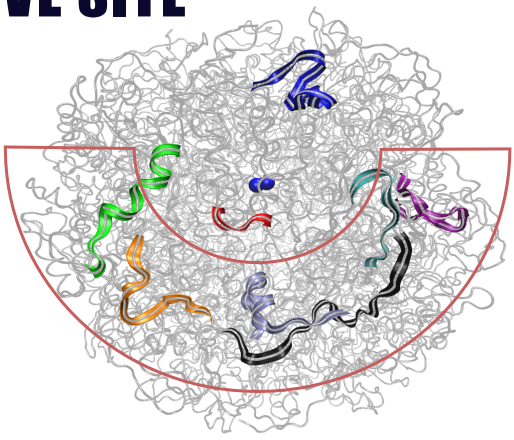
148,648 atoms
9,744 residues

2 Ni2+ ions per dimer, 12 active sites

AVERAGE RMSF – 10.5 M UREA



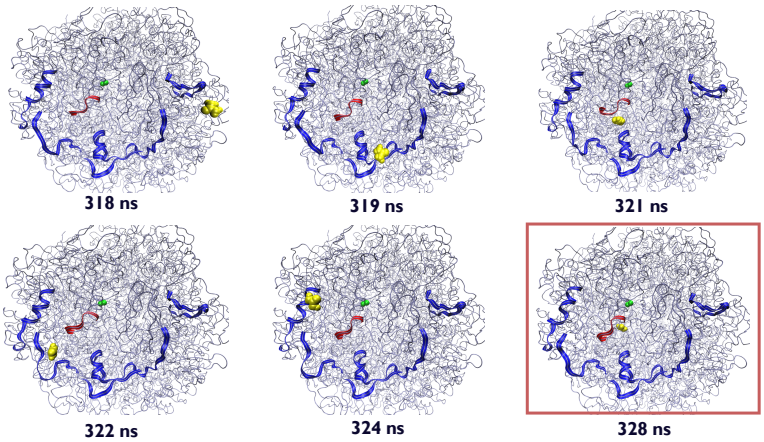
HIGH RMSF REGIONS NEAR ACTIVE SITE



α326-α330 (564-568,AS)
α533-α553 (771-791)
β55- β68 (55-68)
β100-β111 (100-111)
β113-β130 (113-130)
β177-β184 (177-184)
β222-β238 (222-238)
α1-α17 (239-255)

Note that high-RMSF regions are defined as greater than the average + 1σ.

INTERACTION OF UREA WITH HIGH-RMSF REGIONS



Snapshots of urea 20177 (yellow) interacting with regions of high RMSF (blue) before descending into the active site cavity. The loop of the active site-covering flap is depicted as a red ribbon. The Ni^{2+} ions are depicted as green Van der Waals spheres.

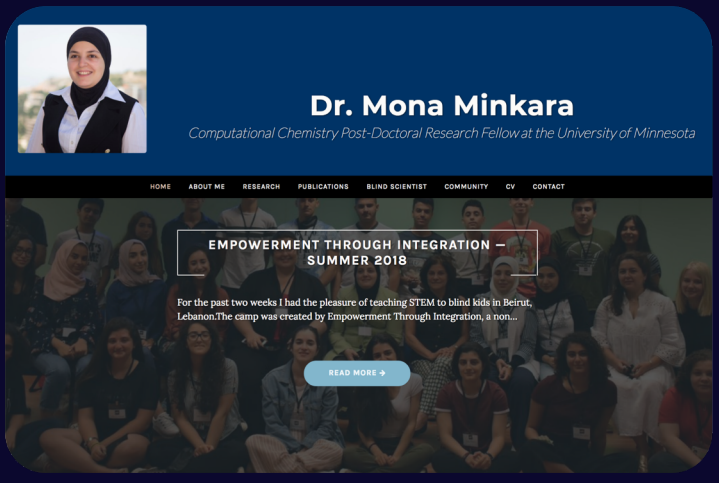
THE FUTURE

VISION IS MORE THAN SIGHT

WELCOMING NEW PERSPECTIVES

My current advisor, J. Ilja Siepmann was one of those who saw the necessity of including a unique perspective.

To create a brighter future for science, I believe it is imperative to foster new perspectives.



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ACKNOWLEDGEMENTS

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I thank Mink Inc. for assistance in the preparation of this presentation.

And, most importantly, I would like to thank you!