



**Training World-Class
Science-Technology-Engineering-Mathematics (STEM)
Research Faculty at Higher Education Institutions in India**

U.S.-India Education Foundation

Indo-US 21st Century Knowledge Initiative

(Formerly Obama-Singh Initiative)

OHIO STATE UNIVERSITY-ALIGARH MUSLIM UNIVERSITY

Aligarh April 29, 2016



Research and Teaching Experience at OSU and NIST Within the Framework of INDO-US STEM-ER Project

Research Supervisors

OSU SUPERVISOR:

Prof. Sultana N. Nahar

**D/o Astronomy and
Astrophysics,**

AMU SUPERVISOR:

Prof. Tauheed Ahmad

D/o Physics, Spectroscopy Lab

Education Supervisor

Dr. Karen Irving,

Hala

STEM-ER Fellow

Purpose of the Project

- Two-year dual-degree graduate program specializing in teaching STEM subjects and state-of-the-art research.
- Enhance educational excellence and collaborative research to address global challenges in STEM areas.
- Establish a joint Centre of Excellence in STEM Education and Research.

Research Experience at OSU

Research Project: Electron Impact Excitation of Si IX using Briet-Pauli R-Matrix Method (BPRM) & Line Ratio Calculation

- ❖ Guidance by renowned astrophysicist: Anil Pradhan and S Nahar of OSU
- ❖ Expansion of research field: from Exp. to Theory
- ❖ Facility of supercomputing at OSC
- ❖ Got an opportunity to learn and utilize the best available atomic structure codes: **Superstructure and Briet Pauli R-Matrix Codes**
- ❖ Atomic and collisional data for Si IX: **SS & BPRM**
- ❖ **Line Ratio calculation**
- ❖ **Discussion at ASTRO-COFFEE**

Research Experience at National Institute of Standard and Technology (NIST)

VISIT: Dec, 2014 to Jan, 2015 with AMU supervisor Prof. Tauheed Ahmad

- ❖ Performed experiment on 2m FT and FT 700 FTS using HCL**
- ❖ Learned XGREMLIN for FTS analysis**
- ❖ Learned critical assessment of spectral data.**
- ❖ Use of XL1100 scanner for wavelength calibration**
- ❖ Learned IDEN, GWADDION, DENSITOGRAPH codes for spectral analysis.**
- ❖ Discussion for joint project with G. Nave on Fe group elements**

VISIT: 10 March, 2015 to 17 March , 2015 (INVITED)

- ❖ Invited to deliver a talk**
- ❖ Offered to join the project on IRON group elements funded by NASA**
- ❖ Learned the techniques for spectral analysis with hyperfine splitting**
- ❖ Work on Sc II started using FTS data with G. Nave**
- ❖ Discussion on future experiments in VUV region on 10.7-m NIVS using IP**

Research achievements under INDO-US

- ❖ Research paper presentation at Division of Atomic Molecular & Optical Physics(DAMOP)-2015, OHIO, USA.**
- ❖ Got an invitation by Quantum Measurement Division, NIST, Washington DC for invited talk.**
- ❖ Research work on Sc II presented at International Astronomical Union (IAU), Hawaii.**
- ❖ Paper on Sc II in proceeding of IAU, 2016 series.**
- ❖ Paper accepted for presentation at APIP, France**

Teaching Experience at OSU

Learned the Method of STEM teaching (Method Class)

Curriculum Development for year 2050 (Physics)

Assessment: Formative and Summative

Multicultural Course

Observed Teaching OSU senior faculty in Physics

Education Project: *An Investigation of Conceptual Understanding of Quantum*

Mechanics at Aligarh Muslim University, India

Field Experience at Undergraduate (AMU)

Utilization of STEM teaching training at AMU undergraduate.

Novelty of STEM-ER Program

- ❖ **At a time trained with the world class advanced research and STEM teaching.**
- ❖ **Learned to balance between both the research and teaching responsibilities.**
- ❖ **Utilization of STEM teaching and pedagogical methods in interdisciplinary education including digital e-learning.**
- ❖ **Field experience in undergraduate STEM teaching at AMU and guidance by The Ohio State University.**
- ❖ **Joint supervision by The Ohio State University and AMU faculty.**
- ❖ **Exchange visit by AMU supervisor to OSU to monitor and guide the Fellow.**
- ❖ **Long Term Collaboration: OSU and NIST**



How the STEM ER Experience made all the difference

Asim Rizvi, PhD

(defended April 23rd 2016)

The Ohio State University



Our Program

- **(Very) Extensive**
- **A Masters Degree in Science Education**
- **The Research Element**

- **Benefits**

My Research

- Laboratory of Dr Qi En Wang
- The Mouse Xenograft Model
- Techniques
- A very international and inclusive research environment

Education

- **The American System of Education encourages cross pollination**
- **Teaching and Learning**
- **The Theoretical Frame Work**
- **Research in Social Sciences (Education)**



CUREs

- **Authentic Tasks**
- **Inquiry**
- **Engaging in research**
- **The Phage Hunters**
- **Possible Publications**

- **Advantages for the Indian Undergraduate**

n Plus



STEM-ER Project: Personal Experiences

Malik Azeem Anwar

OSU Research Advisor

Dr. Guramrit Singh
RNA Biology Centre
D/O Molecular Genetics, OSU, USA.

AMU Research Advisor

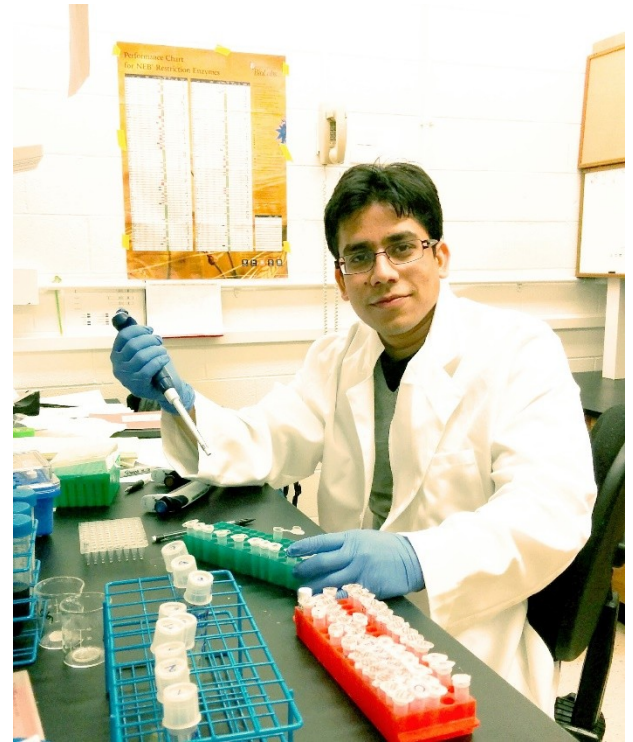
Prof. Mohammad Afzal,
Department of Zoology, AMU.

Education Advisor

Dr. Karen Irving
Department of Teaching and Learning
OSU, USA

Research Experience and Training

- **Training:** Hands on training of the most advanced techniques of RNA Biology.
- **Facilities:** Had access to the lab 24 x 7 and State of Art research equipments.



World-class Research Facilities
available at OSU

- **Connections:** Interaction with Molecular Geneticists and Nobel Laureates Prof. Craig Mello and Prof. Carol Greider.
- **Project:** Worked on Splicing Protein Complexes (thrust area of Molecular Genetics).

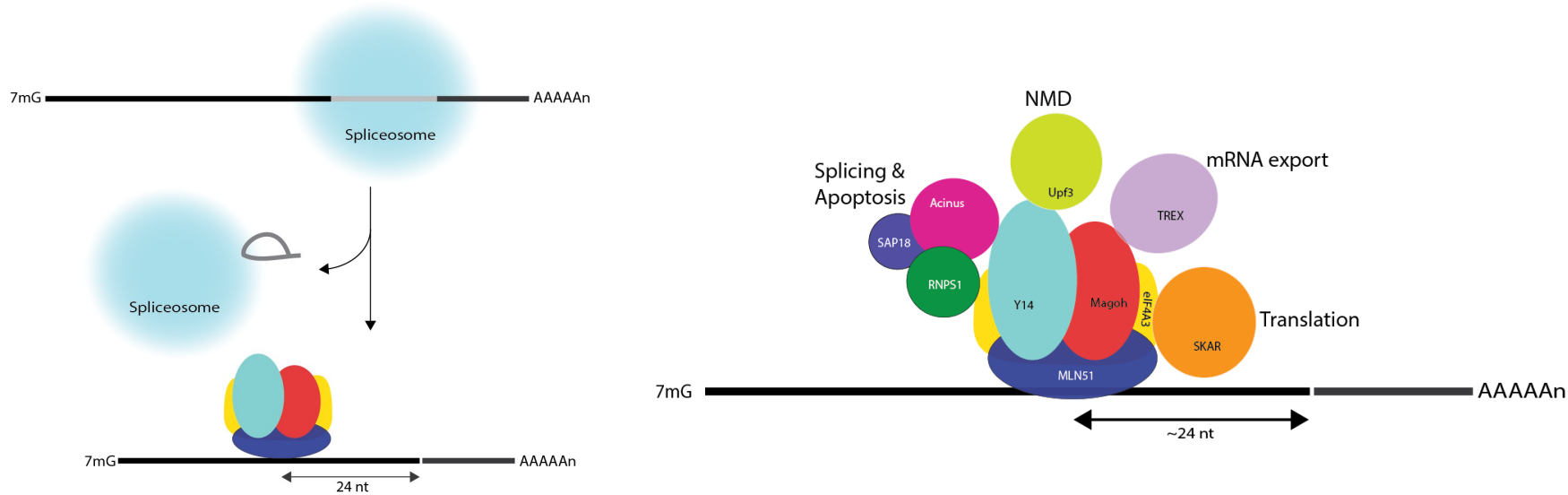


Research Training

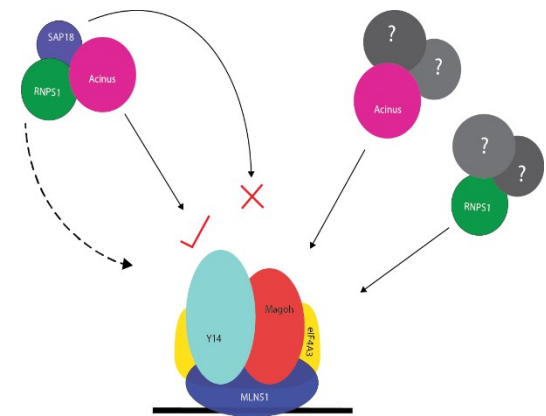
Learnt Molecular Biology Techniques such as:

- Gene cloning
- Cell culture
- Western Blotting
- Immunoprecipitation
- RIPiT-Seq
- Creating deep sequencing libraries

Research Findings



- EJC is deposited as result of splicing
- Studied interaction of protein complex (ASAP) with Exon Junction Complex (EJC).
- Found out that ASAP interacts with EJC strongly via Acinus and weakly via RNPS1



Education

- Education courses included Science Methods Class, Assessment class, Multicultural course, etc.
- Mission of these Courses were to prepare highly effective educators who teach, lead, and serve.
- Most interesting to me was “**Methods in Teaching Secondary Science**”
- This course trains the educators to apply research-based practices in the Science class that promotes active learning.

Balance between Research and Education

- It was challenging to maintain a perfect balance between Education and Research.
- Both Life Science research & education have different approaches.
- However, we were able to balance our time and effort in learning education skills and carry out research in STEM discipline successfully and achieved a lot.

STEM-ER: A NOVEL INITIATIVE

RELEVANCE, INSIGHTS & EXPERIENCES



BY— **NIDA REHMANI**
STEM-ER FELLOW

T · H · E
**OHIO
STATE**
UNIVERSITY

OSU Research Advisor- **Altaf A. Wani (Professor)**

Biomedical Research Tower

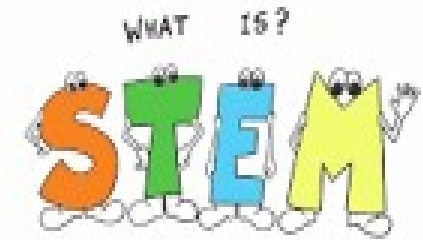
OSU Education Advisor- **Karen Irving (Professor)**

Department of Teaching & Learning

AMU Research Advisor- **S.M. Hadi (Professor)**

Department of Biochemistry

STEM-ER DUAL DEGREE PROGRAM



- A PILOT PROJECT FOR TRAINING WORLD CLASS FACULTY.
- AN AMALGAM OF CUTTING EDGE RESEARCH TRAINING AND TEACHING APPRENTICESHIP.
- ACADEMIC COLLABORATION FOR HIGHER EDUCATION IN STEM FIELDS.



Teaching and research are not to be confused with training for a profession. Their greatness and their misfortune is that they are a refuge or a mission.

(Claude Levi-Strauss)

LABORATORY EXPERIENCES



- **WORLD CLASS FACILITIES**
- **HANDS ON TRAINING**
- **LAB MEETINGS**
- **WORKING HOURS**
- **SCIENTIFIC DISCUSSIONS**
- **BSL-2 LAB SAFETY TRAINING**



**TECHNIQUES
LEARNT-**

- **PLASMID EXTRACTION**
- **AGAROSE GEL ELECTROPHORESIS**
- **CELL CULTURE**
- **WESTERN BLOTTING**
- **IMMUNOFLUORESCENCE**
- **METHYLENE BLUE ASSAY**

OUTSIDE LAB

RENDEZVOUS WITH NOBEL
LAUREATE: CAROL GREIDER



OUTREACH
PROGRAMS



EDUCATIONAL EXPERIENCES

INDEPENDENT STUDY

IRB & CITI TRAINING

CURRICULUM DESIGNING

FEEDBACK & REFLECTIONS

MICROTEACHING

VIDEOTAPING

FIELD EXPERIENCE

M.ED. THESIS



AMISH COUNTRY TRIP



HOCKING HILLS



MEETING WITH ASTRONAUT & SENATOR JOHN GLENN



RECEPTION



FAREWELL



"Now this is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning."

Winston Churchill

True leaders
don't create
followers...
they create
more leaders!

J. SAKIYA SANDHER

Thank You

