

Assistant Professor

Department of Mechanical Engineering, South Dakota State University
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✉ Saikat.Basu@sdstate.edu

☎ 605 688-6868 | [Linked](#) | [YouTube](#)

🌐 [Basu Lab: Biomedical & Bioinspired Fluids](#)

Research Interests **Focus:** Theoretical and Computational Fluid Mechanics modeling, with 'table-top' experiments
Specific interests: Biofluid Mechanics; Vortex Dynamics; Interfacial Mechanics; Respiratory Flow Physics; Aerial and Inhaled Transmission of Pathogens; Tumor Perfusion; Drug Delivery

Teaching Interests **Undergraduate level:** Statics, Dynamics, Fluid Mechanics, Biomechanics, Numerical Methods
Graduate level: Advanced Fluid Dynamics, Biomedical Applications, Nonlinear Dynamics

Education

08/2009 – 05/2014	Ph.D. in Engineering Mechanics Specialization: Fluid Mechanics Dissertation: <i>Dynamics of complex laminar wakes: modeling, analysis, and experiments.</i> Link Advisor: Dr. Mark A Stremler Link to academic genealogy (Mathematics Genealogy Project)	Virginia Tech Department of Engineering Science & Mechanics
07/2005 – 05/2009	B.E. in Civil Engineering First Class with Honors Electives: Wind Engineering, Structural Dynamics	Jadavpur University (India)

Appointments

01/2019 – Present	Assistant Professor (tenure track)	South Dakota State University (SDSU) Department of Mechanical Engineering, Jerome J Lohr College of Engineering
02/2021 – 01/2024	Affiliate (external member)	University of North Carolina (UNC) at Chapel Hill UNC Chapel Hill – NC State University Joint Department of Biomedical Engineering
04/2016 – 12/2018	Postdoctoral Fellow	UNC Chapel Hill Department of Otolaryngology / Head and Neck Surgery, School of Medicine Area: Respiratory transport, topical drug delivery – <i>computational modeling</i> Added appointment: Instructor, UNC-NCSU Joint Dept. of Biomedical Engineering (2017-18)
06/2014 – 03/2016	Postdoctoral Scholar	Okinawa Institute of Science & Technology (Japan) Nonlinear and Non-equilibrium Physics Unit Area: Interfacial mechanics from drop impact – <i>theoretical modeling, experiments</i>
08/2009 – 05/2014	Graduate Assistant	Virginia Tech Department of Engineering Science & Mechanics Area: Vortex dynamics – <i>theoretical modeling, scientific computations, simple experiments</i>

Funding and Grantsmanship

Net research funding secured as faculty, as of 08/2024 = \$1,309,606

Awarded extramural funding:

13. NSF CAREER Grant | CBET 2339001 | Fluid Dynamics program | [NSF link to CAREER Award Abstract](#)
CAREER: The Contagion Science: Integration of inhaled transport mechanics principles inside the human upper respiratory tract at multi scales
Period: 01/2024 – 12/2028 | **Amount:** \$540,428 | **Grant Role:** Principal Investigator

12. **NSF Supplemental Award for Travel (an NSF – European Research Council Mechanism)**
CAREER supplement: The Contagion Science: Integration of inhaled transport mechanics principles inside the human upper respiratory tract at multi scales
 Global Venture Fund | European Collaborator Site: Leiden University Medical Center, The Netherlands
Period: 01/2024 – 12/2028 | **Amount:** \$17,058 | **Grant Role:** Principal Investigator
11. **NIH-NIGMS COBRE RPL Grant | Project Number 5P20GM109024-07**
Computational and theoretical fluid mechanics modeling for transport in dense tumors
Period: 03/2023 – 02/2026 | **Amount:** \$450,000 | **Grant Role:** Principal Investigator
10. **Industry-sponsored project**
Sponsored collaboration with Aptar Pharma: In silico design of muco-adhesive depot solutions and delivery devices for targeted intranasal vaccines
Period: 08/2022 – 05/2024 | **Amount:** \$66,066 | **Grant Role:** Principal Investigator
9. **NSF CBET RAPID Grant for COVID-19 | Award Number 2028069**
Collaborative Research: New generation of a bio-inspired protective mask based on thermal & vortex traps
Period: 05/2020 – 04/2022 | **Amount:** \$199,712 (Basu's spending authority: \$62,824)
Grant Role: Co-Principal Investigator (with S Jung at Cornell University and LP Chamorro at UIUC)
8. **NIH-NIGMS COBRE Pilot Grant from North Dakota State University (PI: S Mallik, Ph.D.)**
Computational tracking of perfusion in solid tumors
Period: 04/2021 – 07/2022 | **Amount:** \$49,999 | **Grant Role:** Subaward Principal Investigator
7. **NIH R01 Subcontract # SA1900491 | Grant HL122154 at UNC Chapel Hill (PI: JS Kimbell, Ph.D.)**
Improving topical drug delivery for treatment of chronic rhinosinusitis
Period: 04/2019 – 03/2020 | **Amount:** \$20,021 | **Grant Role:** Subaward Principal Investigator

Awarded intramural funding:

6. **Haarberg Drug, Disease and Delivery (3D) Center Exploratory Grant**
Development of a digital platform to assess targeted regional drug delivery for airway sites
Period: 04/2023 – 06/2024 | **Amount:** \$99,710 | **Grant Role:** Principal Investigator
5. **Haarberg 3D Center Award for Undergraduate Research Support**
'Peak band' vs. 'Monotonic decay': exploring particle deposition and penetration in anatomic cavities
Period: 02/2023 – 06/2023 | **Amount:** \$3,000 | **Grant Role:** Principal Investigator
4. **Scholarly Dissemination Award from the SDSU Office of Academic Affairs**
Use of computational fluid dynamics to track respiratory transport in the throat
Period: 11/2019 – 05/2020 | **Amount:** \$500 | **Grant Role:** Principal Investigator
3. **TraCS Pilot Grant 2KR971701, supported by NIH-NCATS Award UL1TR002489 at UNC Chapel Hill**
CFD-based identification of optimal particle sizes for targeted drug delivery at laryngeal granulomas
Period: 02/2018 – 05/2019 | **Amount:** \$2,000 | **Grant Role:** Principal Investigator (prior to SDSU)

Invited full proposal(s):

2. **ARPA-H BREATHE**
Adaptable biosensing system coupled with multiscale risk modeling integrated into HVAC building controls
Post-evaluation of a 6-page solution summary, a full proposal has been invited.
Period: 2024 – 2025 | **Invited budget:** \$52 million (Basu's spending authority: \$1.295 million)
Grant Role: Senior Personnel (Lead institutions: MIT; Triple Ring Technologies)

1. **America's Seed Fund: NSF SBIR/STTR Phase I – Biomedical Technologies (BM)**

Mechanics-informed prompt estimation of drug delivery efficiency at target tissue regions to fast-track the design and development of airway therapeutics

Post-evaluation of an extended project pitch, a full proposal has been invited.

Period: 2024 – 2025 | Invited budget: \$275,000 | Grant Role: Company Founder and Chief Scientist

Industry Collaborations (with Non-Disclosure Agreements in place, as of 08/2024)

- Carrier Corporation (East Syracuse, NY)
 - Triple Ring Technologies (Newark, CA)
 - Well Living Lab (Rochester, MN)
 - Aptar Pharma (Congers, NY)
 - NextBreath (Baltimore, MD)
 - Applied Research Associates (Raleigh, NC)
 - Dr. Ferrer Biopharma (Hallandale Beach, FL)
 - Environmental Medicine, Inc. (Westwood, NJ)
 - Fractal Therapeutics (Lexington, MA)
 - Innoveyda (Foothill Ranch, CA)
 - MedScience Research Group, Inc. (West Palm Beach, FL)
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Publications, including preprints h-index = 14, i10-index = 19 (as of 08/2024) [Google Scholar link](#)

Note: Underline denotes students supervised by Dr. Basu | * = Basu is corresponding author.

33.* **S Basu**, LP Chamorro, M Yeasin, MA Stremler

Modeling the effect of vorticity on inhaled transport in the upper airway

arXiv:2406.09708, under review, 2024 | [Download PDF](#)

32. M Singh, **S Basu**, D Samanta

Viscoelastic fluid droplet impact on thin liquid films: Suppression of secondary droplets

Under review, 2024 | [Download PDF](#)

31.* **S Basu**

On the mechanics of inhaled bronchial transmission of pathogenic microdroplets generated from the upper respiratory tract, with implications for infection onset

arXiv:2406.17895, under review, 2024 | [Download PDF](#)

30. Z Wu, **S Basu**, S Kim, M Sorrells, FJ Beron-Vera, S Jung

Coherent spore dispersion via drop-leaf interactions

Science Advances, Volume 10(5), eadj8092, 2024 | [Download PDF](#)

Media attention: [Yahoo! News](#), [Science Daily](#)

29.* MMH Akash, Y Lao, PA Balivada, P Ato, NK Ka, A Mituniewicz, Z Silfen, J Suman, A Chakravarty, D Joseph-McCarthy, **S Basu**

On a model-based approach to improve intranasal spray targeting for respiratory viral infections

Frontiers in Drug Delivery, Sec. Respiratory Drug Delivery, Volume 3, 1164671, 2023 | [Download PDF](#)

- 28.* **MMH Akash, N Chakraborty, J Mohammad, K Reindl, S Basu**
Development of a multiphase perfusion model for biomimetic reduced-order dense tumors
Experimental and Computational Multiphase Flow, Volume 5(3), 319-329, 2023 | [Download PDF](#)
 Media attention: [The Brookings Register](#)
27. J Yuk, **MMH Akash, A Chakraborty, S Basu**, LP Chamorro, S Jung
Morphology of pig nasal structure and modulation of airflow, thermal conditioning, and olfactory functionality
Integrative and Comparative Biology, Volume 63(2), 304-314, 2023 | [Download PDF](#)
 Media attention: [Phys.Org](#)
26. DV Egeren, M Stoddard, **A Malakar, D Ghosh, A Acharya, S Mainuddin, B Majumdar**, D Luo, R Nolan, D Joseph-McCarthy, LF White, NS Hochberg, **S Basu, A Chakravarty**
No magic bullet: limiting in-school transmission in the face of variable SARS-CoV-2 viral loads
Frontiers in Public Health, Sec. Infectious Diseases: Epidemiology and Prevention, Volume 10, 941773, 2022 | [Download PDF](#)
 Media attention: [The Nation](#)
- 25.* **S Basu**, UA Khwaja, SAA Rizvi, MA Sanchez-Gonzalez, G Ferrer
Evaluation of Patient Experience for a Computationally-Guided Intranasal Spray Protocol to Augment Therapeutic Penetration: Implications for Effective Treatments for COVID-19, Rhinitis, and Sinusitis
Medical Research Archives, Volume 10(4), 2022 | [Download PDF](#)
- 24.* J Yuk, **A Chakraborty, S Cheng, CI Chung, A Jorgensen, S Basu***, LP Chamorro*, S Jung*
On the design of particle filters inspired by animal noses | * joint corresponding authorship
Journal of the Royal Society Interface, Volume 19(188), 20210849, 2022 | [Download PDF](#)
 Media attention: [Cornell Chronicle](#)
- 23.* **S Basu, MMH Akash, NS Hochberg, BA Senior, D Joseph-McCarthy, A Chakravarty**
From SARS-CoV-2 infection to COVID-19 morbidity: an in silico projection of virion flow rates to the lower airway via nasopharyngeal fluid boluses
Rhinology Online, Volume 5(5), 10-18, 2022 | [Download PDF](#)
 Media attention: [News Medical Life Sciences](#)
- 22.* **S Basu**
Computational characterization of inhaled droplet transport to the nasopharynx
Scientific Reports, Volume 11(1), 6652, 2021 | [Download PDF](#)
 Media attention: [Newswise](#), [ScienceNewsNet.in](#)
21. MA Stremmer, **S Basu, E Masroor**
Streamline patterns in 2P vortex street equilibria - corrigendum
Journal of Fluid Mechanics, Volume 901 E2, 1-4, Cambridge University Press, 2020 | [Download PDF](#)
- 20.* **S Basu, LT Holbrook, K Kudlaty, O Fasanmade, J Wu, A Burke, B Langworthy, M Mamdani, Z Farzal, WD Bennett, JP Fine, BA Senior, AM Zanation, CS Ebert Jr., AJ Kimple, BD Thorp, DO Frank-Ito, GJM Garcia, JS Kimbell**
*Numerical evaluation of spray position for improved nasal drug delivery*¹
Scientific Reports, Volume 10(1), 10568, 2020 | [Download PDF](#)
 Media attention: [New Scientist](#), [Newswise](#), [Medical Express](#)

¹ Featured in [Editor's Choice collection](#) showcasing some of the latest research on fluid dynamics across different fields and applications.

19. S Treat, CS Ebert Jr., Z Farzal, **S Basu**, AM Zanation, BD Thorp, JS Kimbell, BA Senior, AJ Kimple
*Intranasal corticosteroids: patient administration angles and impact of education*²
Rhinology Online, Volume 3, 160-166, 2020 | [Download PDF](#)
 18. BM Brandon, WH Stepp, **S Basu**, JS Kimbell, BA Senior, WW Shockley, J Madison Clark
Nasal airflow changes with bioabsorbable implant, butterfly and spreader grafts
The Laryngoscope, Volume 130(12), E817-E823, 2020 | [Download PDF](#)
 17. Z Farzal, **S Basu**, A Burke, O Fasanmade, E Mamuyac, W Bennett, C Ebert Jr., A Zanation, B Senior, JS Kimbell
Comparative study of simulated nebulized and spray particle deposition in chronic rhinosinusitis patients
International Forum of Allergy and Rhinology, Volume 9(7), 746-758, 2019 | [Download PDF](#)
 16. LF Tracy, **S Basu**, P Shah, DO Frank-Ito, S Das, AM Zanation, JS Kimbell
Impact of endoscopic craniofacial resection on simulated nasal airflow and heat transport
International Forum of Allergy and Rhinology, Volume 9(8), 900-909, 2019 | [Download PDF](#)
- Working preprints
- 15.* **S Basu**, [A Malakar](#), [MMH Akash](#)
A mechanistic model for smallpox transmission via inhaled aerosols inside respiratory pathways
arXiv:2403.04064, uploaded 2024 | [Download PDF](#)
 - 14.* [ML Tesch](#), [A Malakar](#), [SAA Rizvi](#), [MMH Akash](#), [G Ferrer](#), **S Basu**
Enhancing intranasal therapeutic penetration for treating respiratory illness: A clinical human factor feasibility study
Preprints.org, <https://doi.org/10.20944/preprints202312.1002.v1>, uploaded 2023 | [Download PDF](#)
 - 13.* **S Basu**
Approaching Fermat's Conjecture from the Principle of Mathematical Induction
Logic & Philosophy of Mathematics eJournal, SSRN 4023652, uploaded 2022 | [Download PDF](#)
 - 12.* **S Basu** and [S Das](#)
On a model-based analysis of vortex formations and decay in flows through bio-inspired T-shaped cavities
arXiv:2211.06964, uploaded 2022 | [Download PDF](#)
- [Prior to SDSU]
11. JS Kimbell, **S Basu**, GJM Garcia, DO Frank-Ito, FB Lazarow, E Su, DE Protsenko, Z Chen, BJ Wong
Upper airway reconstruction using anatomic optical coherence tomography: effects of airway bend on airflow resistance
Lasers in Surgery and Medicine, Volume 51(2), 150-160, 2019 | [Download PDF](#)
 - 10.* **S Basu**, DO Frank-Ito, JS Kimbell
On computational fluid dynamics models for sinonasal drug transport: relevance of nozzle subtraction and nasal vestibular dilation
International Journal for Numerical Methods in Biomedical Engineering, Volume 34(4), e2946, 2018 | [Download PDF](#)
 9. EL Perkins, **S Basu**, GJM Garcia, RA Buckmire, RN Shah, JS Kimbell
Ideal inhaled steroids for vocal granulomas: preliminary study using computational fluid dynamics
Otolaryngology – Head and Neck Surgery, Volume 158(3), 511-519, 2018 | [Download PDF](#)

² European Rhinologic Society award for [best online paper](#) during 2019 – 2020.

8. BM Brandon, GK Austin, G Fleischman, **S Basu**, JS Kimbell, WW Shockley, J Madison Clark
Comparison of airflow between spreader and butterfly grafts using computational fluid dynamics in a cadaveric model
JAMA Facial Plastic Surgery, Volume 20(3), 215-221, 2018 | [Download PDF](#)
 7. JS Kimbell, **S Basu**, Z Farzal, BA Senior
Characterizing nasal delivery in 3D models before and after sinus surgery
Respiratory Drug Delivery, Volume 1, 181-188, 2018 | [Download PDF](#)
 - 6.* **S Basu**, A Yawar, A Concha, MM Bandi
*On angled bounce-off impact of a drop impinging on a flowing soap film*³
Fluid Dynamics Research, Volume 49(6), 065509, 2017 | [Download PDF](#)
 - 5.* **S Basu** and MA Stremmler
Exploring the dynamics of '2P' wakes with reflective symmetry using point vortices
Journal of Fluid Mechanics, Volume 831, 72-100, Cambridge University Press, 2017 | [Download PDF](#)
 - 4.* **S Basu** and MA Stremmler
On the motion of two point vortex pairs with wake-inspired glide-reflective symmetry in a periodic strip
Physics of Fluids, Volume 27(10), 103603, 2015 | [Download PDF](#)
 3. MA Stremmler and **S Basu**
On point vortex models of exotic bluff body wakes
Fluid Dynamics Research, Volume 46(6), 061410, 2014 | [Download PDF](#)
 2. MA Stremmler, A Salmazadeh, **S Basu**, and CHK Williamson
A mathematical model of 2P and 2C vortex wakes
Journal of Fluids and Structures, Volume 27(5-6), 774-783, 2011 | [Download PDF](#)
- Working preprint
1. SB Sreenath, JS Kimbell, **S Basu**, AJ Coniglio, TE Fontenot, BD Thorp, CS Ebert, BA Senior, AM Zanation
Comparative Analysis of the Main Nasal Cavity and the Paranasal Sinuses in Chronic Rhinosinusitis: An Anatomic Study of Maximal Medical Therapy
arXiv:1811.00649, uploaded 2018 | [Download PDF](#)

Peer-reviewed* Conference Articles

*Acceptance for oral presentation based on review of **extended abstracts / short papers**

Note: Lead author is the presenter, unless otherwise mentioned. Underline denotes students supervised by Dr. Basu.

15. **S Basu**, A Malakar, MMH Akash
On modeling the mechanics of smallpox transmission through inhaled pathogens in respiratory domains
International Congress of Theoretical and Applied Mechanics (ICTAM), an International Union of Theoretical and Applied Mechanics (IUTAM) conference, August 2024, Daegu, South Korea
14. **S Basu**
Modeling local instability effects on particle transport inside anatomic respiratory cavities
Perspectives in Nonlinear Dynamics (satellite conference to STATPHYS-28), August 2023, Chennai, India

³ Awarded the [Fluid Dynamics Research Prize 2018](#) from the Japan Society of Fluid Mechanics; see [◊](#) under 'Awards and Honors'.

13. **S Basu**

Recent results on droplet transmission in the upper airway leading to SARS-CoV-2 infection and an estimation of the infectious dose

ICTAM, August 2020+1, Milan, Italy

12. **S Basu**, Z Farzal, L Holbrook, O Fasanmade, B Langworthy, JS Kimbell

Numerical and experimental investigations on nasal spray usage strategies in chronic rhinosinusitis

International Society for Aerosols in Medicine (ISAM) Congress, May 2019, Montreux, Switzerland

11. Z Farzal, **S Basu**, M Mamdani, BD Thorp, AM Zanation, AJ Kimple, BA Senior, CS Ebert Jr., JS Kimbell

Comparative analysis of nebulizer and “line of sight” spray drug delivery to chronic rhinosinusitis target sites

ISAM Congress, May 2019, Montreux, Switzerland

[Prior to SDSU]

10. MA Stremmer, W Yang, E Masroor, **S Basu**

Classifying relative vortex motions in 2P mode wakes

7th Conference on **Bluff Body Wakes and Vortex-Induced Vibrations (BBVIV)**, July 2018, Carry-le-Rouet, France

9. **S Basu**, N Witten, JS Kimbell

Influence of localized mesh refinement on simulations of post-surgical sinonasal airflow

Journal of Aerosol Medicine and Pulmonary Drug Delivery, Vol. 30(3), 2017

Combined Otolaryngology Spring Meetings (COSM) – Annual Triological Society Meeting, April 2017, San Diego, CA

8. JS Kimbell, S Sreenath, **S Basu**, A Coniglio, T Fontenot, B Thorpe, CS Ebert, BA Senior, AM Zanation

Anatomic comparison of the main nasal cavity and paranasal sinuses before and after maximal medical therapy for chronic rhinosinusitis

COSM – Annual Triological Society Meeting, April 2017, San Diego, CA

7. MA Stremmer, W Yang, **S Basu**

On the structure and dynamics of wakes behind oscillating cylinders

Society of Engineering Science (SES) Annual Technical Meeting, October 2016, College Park, MD

6. **S Basu**, A Yawar, A Concha, MM Bandi

On modeling drop impacts at shallow angles on flowing soap films

ICTAM, August 2016, Montreal, Canada

5. MA Stremmer and **S Basu**

Point vortex models for exotic laminar vortex streets

ICTAM, August 2016, Montreal, Canada

4. H Aref, **S Basu**, MA Stremmer (presenter), V Vlachakis

On point vortex models of bluff body wakes

International Union of Theoretical and Applied Mechanics (IUTAM) – Symposium of Vortex Dynamics, March 2013, Fukuoka, Japan

3. **S Basu** and MA Stremmer

A point vortex model of singly-periodic four-vortex wake structures

ICTAM, August 2012, Beijing, China

2. MA Stremmer and **S Basu**
Mathematical modeling of exotic vortex wakes
SES Annual Technical Meeting, October 2011, Northwestern University, Evanston, IL
 1. MA Stremmer, **S Basu**, T Schnipper, A Andersen
A mathematical model of the vortex dynamics in 2P and 2C wakes
European Nonlinear Dynamics Conference (ENOC), July 2011, Rome, Italy
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Conference Oral Presentations

Note: Lead author is the presenter, unless mentioned otherwise in parenthesis. Underline = students/postdocs mentored by Basu.

39. M Yeasin, MMH Akash, **S Basu**
A mechanics-based model for inhalation-driven transmission of smallpox
To be presented at the **American Physical Society (APS) Division of Fluid Dynamics (DFD) Annual Meeting**, November 2024, Salt Lake City, UT
38. MMH Akash, M Yeasin, P Ran, AB Merife, A Pandey, P Soman, **S Basu**
Modeling transport in physiologically realistic tumor microenvironment
To be presented at the **APS DFD Annual Meeting**, November 2024, Salt Lake City, UT
37. E Louwagie and **S Basu**
Exploring statistical laws governing inhalation-induced upper airway deposition
To be presented at the **APS DFD Annual Meeting**, November 2024, Salt Lake City, UT
36. A Malakar, AAT Borojeni, **S Basu**
Parametric numerical analysis of targeted drug delivery for intranasal sprays inside the upper respiratory airspace
APS DFD Annual Meeting, November 2023, Washington DC
35. MMH Akash and **S Basu**
Computational modeling of multiphase transport in physiologically realistic solid tumor vasculature and intratumoral domains
APS DFD Annual Meeting, November 2023, Washington DC
34. AAT Borojeni, MMH Akash, A Malakar (presenter), **S Basu**
An integrative modeling platform for smallpox transmission via respiratory routes
APS DFD Annual Meeting, November 2023, Washington DC
33. **S Basu**, LP Chamorro, S Jung
On the design of scalable, customized particle filters inspired by animal noses
Filters in Biology + Biomimetics (FiBB) conference, Humboldt University of Berlin, May 2023, Berlin, Germany
32. **S Basu**
Modeling of respiratory infection onset mechanics for airborne pathogen
Society for Computational Fluid Dynamics of the Nose and Airway (SCONA) Meeting – held in conjunction with the Asia Oceania ORL-HNS Congress, March 2023, Brisbane, Australia | [Recorded talk](#)

31. MMH Akash, Z Silfen, D Joseph-McCarthy, A Chakravarty, **S Basu**
Can Machine Learning predict particle deposition at specific intranasal regions based on computational fluid dynamics inputs/outputs and nasal geometry measurements?
SDSU Data Science Symposium, February 2023, Brookings, SD
30. MMH Akash, A Tummala, **S Basu**
When fluid mechanics meets virology: revisiting smallpox – a modeling framework for its airborne transmission
APS DFD Annual Meeting, November 2022, Indianapolis, IN
29. A Dasgupta, **S Basu**, D Foti
Coherent structures in the vocal tract and speaking jet: Simulation with realistic geometry
APS DFD Annual Meeting, November 2022, Indianapolis, IN
28. **S Basu**, LP Chamorro, MA Stremmer
On the impact of vortex formation on particle trapping in respiratory paths
US National Congress of Theoretical and Applied Mechanics (USNC/TAM), June 2022, Austin, TX
27. Z Silfen, MMH Akash, M Cherepashensky, A Chakravarty, **S Basu**, D Joseph-McCarthy
In silico prototyping for intranasally administered agents for COVID-19 and other respiratory pathogens
APS April Meeting, April 2022, New York, NY
26. Z Wu, **S Basu**, FJ Beron-Vera, M Sorrells, S Jung
Spore dispersal by elasticity-vortex coupling from a leaf upon raindrop impact
APS March Meeting, March 2022, Chicago, IL
25. **S Basu**
Mechanics of bio-inspired mask filters
Press presentation – **APS DFD Annual Meeting**, November 2021, Phoenix, AZ | [Recorded talk](#)
24. **S Basu**
When fluid mechanics meets virology: a modeling framework for respiratory infection onset and projection of viral infectious dose
APS DFD Annual Meeting, November 2021, Phoenix, AZ | [Recorded talk](#)
23. MJ Diab, A Chakraborty, S Cheng, J Yuk, CI Chung, A Jorgensen, LP Chamorro, S Jung, **S Basu**
Design of new-generation scalable filters with tortuous pathways inspired from animal noses
APS DFD Annual Meeting, November 2021, Phoenix, AZ
22. MMH Akash, A Mituniewicz, Y Lao, P Balivada, P Ato, N Ka, Z Silfen, A Chakravarty, D Joseph-McCarthy, **S Basu**
A better way to spray? – a model-based optimization of nasal spray use protocols
APS DFD Annual Meeting, November 2021, Phoenix, AZ
21. Z Wu, **S Basu**, F Beron-Vera, M Sorrells, S Jung
Lagrangian coherent structures in spore dispersal around fluttering leaves
APS DFD Annual Meeting, November 2021, Phoenix, AZ
20. J Yuk, K Frohlich, R Connor, **S Basu**, L Chamorro, S Jung
Bio-inspired mask filters with breathing resistance control
APS March Meeting, March 2021, Virtual Conference

19. Z Wu, S Basu, S Jung
Particle dispersal induced by coherent flow structures near oscillating leaves
APS DFD Annual Meeting, November 2020, Virtual Conference
18. A Chakraborty, A Jorgensen, J Yuk, C Chung, LP Chamorro, S Jung, S Basu
Simulating inhaled transport through bio-inspired pathways in mask filters
APS DFD Annual Meeting, November 2020, Virtual Conference
17. J Yuk, B Cooke, K Frohlich, D Morton, CI Chung, A Jorgensen, S Basu, L Chamorro, S Jung
3D-printing mask filters inspired by animal nasal cavity
APS DFD Annual Meeting, November 2020, Virtual Conference
16. CI Chung, J Yuk, A Jorgensen, S Basu, S Jung, LP Chamorro
Vortex traps to capture particles with reduced pressure loss in respiratory masks
APS DFD Annual Meeting, November 2020, Virtual Conference
15. S Basu, R Shah, A Pappa, J Wu, A Burke, W Bennett, W Bodnar, JS Kimbell
Can we use CFD to improve targeted drug delivery in throat?
APS DFD Annual Meeting, November 2019, Seattle, WA
14. S Basu, GJM Garcia, Z Farzal, DO Frank-Ito, JS Kimbell
Exploring nasal spray positioning to improve targeted drug delivery
SCONA Meeting, June 2019, Chicago, IL
- [Prior to SDSU]
13. S Basu, CS Ebert Jr., JS Kimbell
Topical drug delivery: how CFD can “revolutionize” the usage protocol for nasal sprays
APS DFD Annual Meeting, November 2018, Atlanta, GA
12. S Basu, Z Farzal, JS Kimbell
*“Magical” fluid pathways: inspired airflow corridors for optimal drug delivery to human sinuses*⁴
APS DFD Annual Meeting, November 2017, Denver, CO
11. S Basu, JS Kimbell, AM Zanation, CS Ebert Jr., BA Senior
Clinical questions and the role CFD can play
APS DFD Annual Meeting, November 2016, Portland, OR
10. S Basu, A Yawar, A Concha, MM Bandi
Modeling drop impacts on inclined flowing soap films
APS DFD Annual Meeting, November 2015, Boston, MA
9. A Yawar, S Basu, A Concha, MM Bandi
Experimental study of drop impacts on soap films
APS DFD Annual Meeting, November 2015, Boston, MA
8. S Basu and MA Stremmer
Mathematical models for exotic wakes
APS DFD Annual Meeting, November 2014, San Francisco, CA

⁴ Featured in a press conference arranged by the American Institute of Physics (AIP), dated 20-November-2017.

7. **S Basu** and MA Stremler
Point vortex modeling of symmetric four-vortex wakes
APS DFD Annual Meeting, November 2013, Pittsburgh, PA
 6. **S Basu** and MA Stremler
Exotic wake dynamics
Virginia Tech Fall Fluid Mechanics Symposium, Nov. 2013, Blacksburg, VA
 5. **S Basu**, MA Stremler, T Schnipper, A Andersen
Modeling the dynamics of four vortex bluff body wakes
APS DFD Annual Meeting, November 2012, San Diego, CA
 4. **S Basu** and MA Stremler
A mathematical model of laminar wakes with four vortices per period
APS DFD Annual Meeting, November 2011, Baltimore, MD
 3. **S Basu**, MA Stremler, T Schnipper, A Andersen
Mathematical modeling of 2P mode vortex wakes
APS DFD Annual Meeting, November 2010, Long Beach, CA
 2. **S Basu**, MA Stremler, T Schnipper, A Andersen
Point vortex dynamics in exotic wake formations
Virginia Tech Fall Fluid Mechanics Symposium, November 2010, Blacksburg, VA
 1. **S Basu**
Optimizing buckling load carrying capacity of a column
Cochin University of Science and Technology Annual Symposium, March 2008, Cochin, India
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Select Poster Presentations

Note: Lead author is the presenter, unless otherwise mentioned. Underline denotes students mentored by Basu.

12. MMH Akash, M Yeasin, **S Basu**
Integrative modeling of solute transport phenomena in solid tumor microenvironments – bridging computational and theoretical fluid dynamics
SDSU Graduate Research, Scholarship, and Creative Activity Day, April 2024, Brookings, SD
11. E Louwagie⁵ and **S Basu**
Self-organized criticality conjecture for intranasal transport
SDSU Undergraduate Research, Scholarship, and Creative Activity Day (URSCAD), April 2024, Brookings, SD
10. MMH Akash and **S Basu**
Theoretical and computational fluid mechanics modeling for transport in dense tumors
APS DFD Annual Meeting, November 2023, Washington DC
9. MMH Akash and **S Basu**
Computational and theoretical fluid mechanics modeling for transport in dense tumors
NIH-NIGMS COBRE Symposium, July 2023, Fargo, ND

⁵ Outstanding Poster Award for Emma Louwagie, from the College of Engineering

8. A Hall, D Winstead, S Basu
Scaling arguments for particle transport in anatomic channels
SDSU URSCAD, April 2023, Brookings, SD
7. A Dasgupta, **S Basu**, D Foti
Coherence at many scales in the vocal tract and jet during speaking
APS DFD Annual Meeting, November 2022, Indianapolis, IN
6. MMH Akash, N Chakraborty, S Basu
A multiphase tracking of perfusion through in silico dense tumor domain
APS DFD Annual Meeting, November 2021, Phoenix, AZ

[Prior to SDSU]
5. LT Holbrook, A Burke (presenter), **S Basu**, E Monaghan, JS Kimbell, WD Bennett
Patient-specific deposition of nasal sprays in CT-derived human nasal replicas
International Aerosol Conference, September 2018, St. Louis, MO
4. **S Basu**, JS Kimbell, DO Frank-Ito, J Wu, WD Bennett, AM Zanation, BD Thorp, CS Ebert Jr., BA Senior
Allometric quantification of respiratory minute ventilation for chronic rhinosinusitis subjects, using body mass
COSM – Annual Triological Society Meeting, April 2017, San Diego, CA
3. DO Frank-Ito, **S Basu**, JS Kimbell, J Wu, WD Bennett, AM Zanation, CS Ebert Jr., BA Senior
How chronic rhinosinusitis affects sniffing
COSM – Annual Triological Society Meeting, April 2017, San Diego, CA
2. **S Basu**, A Yawar, A Concha, MM Bandi
Characterizing drop impacts on soap films
CompFlu 2016 – Indian Society of Rheology, January 2016, Pune, India
1. S Winter, S Basu, MA Stremmer
A pulsed source-sink system for 3D flow for blood diffusion in open-circulatory insects
NSF Grantees Conference, March 2013, Arlington, VA

Awards and Honors

- 2024 ASME Rising Star of Mechanical Engineering (IMECE 2024)
- 2024 NSF CAREER Award
- 2024 Outstanding Researcher of the Year (Jerome J Lohr College of Engineering, South Dakota State University)
- 2024 Faculty Award for Global Engagement (Office of International Affairs, South Dakota State University)
- 2023 Grantswinship Award (Jerome J Lohr College of Engineering, South Dakota State University)
- 2023 Early Career Investigator of the Year (Jerome J Lohr College of Engineering, South Dakota State University)
- 2020 Yuva Rattan Award (Non-Resident Indian Welfare Society and Ministry of External Affairs, India)
- 2018 ◊ Fluid Dynamics Research Prize (Japan Society of Fluid Mechanics) | [Link to the award citation](#)
- 2015 Departmental Nomination for Outstanding Doctoral Dissertation Award (Graduate School, Virginia Tech)
- 2013 Paul E Torgersen Research Excellence Award (College of Engineering, Virginia Tech)
- 2012 International Union of Theoretical and Applied Mechanics (IUTAM) Travel Award
- 2010 Bechtel Travel Fellowship (Virginia Tech)

- 2009 Pratt Presidential Graduate Fellowship (Virginia Tech)
- 2008 Indian Academy of Science Summer Research Fellowship (India)
- 2008 Graduate Record Examination (GRE) General Test: 1510 / 1600 (800/800 in Quants, 710/800 in Verbal; highest from Basu's undergraduate institution in 2008)
- 2007 Jawaharlal Nehru Center For Advanced Scientific Research (JNCASR) Summer Research Fellowship (India)
- 2004 National Scholarships Scheme – Merit Certificate (India)
- 2002 State Government of West Bengal Award for performance in the Secondary Examination (*Madhyamik Pariksha*, i.e., 10th grade examination; Basu ranked 49th in the state, out of approximately 6,50,000 examinees)
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Selected Media Coverage

- On **News at sdstate**, dated 31-July-2024
Basu receives NSF funding to kickstart a European collaboration | [News link](#)
- At UK-based **Filtration + Separation** magazine, farm ventilation issue, Volume 61(2), p.18, dated July-2024
Replication of pig snouts could influence filter design | [Feature link](#)
- On **News at sdstate**, dated 4-March-2024
SDSU's Basu receives NSF CAREER award for breakthrough research in respiratory fluid dynamics | [News link](#)
- On **Yahoo! News**, dated 31-January-2024
Watch 'tiny tornadoes' spread plant pathogens | [News link](#)
- On **The Brookings Register**, dated 1-May-2023
Basu Lab applies fluid mechanics modeling to cancer research | [News link](#)
- On **Phys.Org**, dated 27-March-2023
Researchers draw inspiration from pig snouts to design novel air filter technologies | [News link](#)
- On **South Dakota Public Broadcasting**, dated 27-March-2023
A commercial application for fluid mechanics research | [News link](#)
- On **SD Public Broadcasting**, dated 23-August-2022 and **The Brookings Register**, dated 8-August-2022
SDSU formalizes partnership with the Indian Institute of Technology Ropar | [News link 1](#), [News link 2](#)
- On **Cornell Chronicle**, dated 9-March-2022
Animal noses inspire new mask, air filter designs | [News link](#)
- On **News Medical Life Sciences**, dated 4-February-2022
Understanding how COVID-19 infection spreads from the upper airways to the lungs | [News link](#)
- On **New Scientist**, dated 14-December-2021
The usual way to spray medicine up your nose may not be the best | [News link](#)
- On **USA Today**, dated 24-May-2021
South Dakota State professor researching nasal spray as added protection against COVID-19 | [News link](#)

- On **SD Public Broadcasting**, dated 20-May-2021 and 24-April-2020
In the Moment: Flow physics for COVID-19 | [Podcast link 1](#), [Podcast link 2](#)
 - On **The Brookings Register**, dated 18-May-2021
SDSU professor improves COVID-19 prevention spray protocol | [News link](#)
 - On **Newswise**, dated 23-March-2021
Aerosol modeling detects SARS-CoV-2 infectious dose, droplets | [News link](#)
 - On **Chemical & Engineering News**, dated 12-August-2020
COVID-19 pandemic has spurred materials researchers to develop antiviral masks | [News link](#)
 - On **Newswise**, dated 21-July-2020
Aerosol modeling targets sinus inflammation | [News link](#)
 - On **Newswise**, dated 20-April-2020
New reusable respirator will trap, kill coronavirus | [News link](#)
 - On **Science Daily**, dated 20-November-2017
'Magic' sinus paths could mean new instructions for nasal sprays | [News link](#)
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Invention Disclosures and Patents

4. *A bioreactor to study solid tumor metastasis*
Invention Disclosure, filed May 2024
Co-Inventors: S Mallik (North Dakota State University), K Van Hosen (North Dakota State University), S Mithul (North Dakota State University), MMH Akash (SDSU), **S Basu** (SDSU)
 3. *A digital platform to assess targeted regional drug delivery inside respiratory airway*
Provisional patent application, in review, filed 02/2024
Inventor: **S Basu** (SDSU)
 2. *A digital platform to assess targeted regional drug delivery inside respiratory airway*
Invention Disclosure, filed March 2023 | Approved by the SDSU Tech Transfer Team
Inventor: **S Basu** (SDSU)
 1. *A mechanism for extracting mechanical energy from flowing fluid using vortex-induced vibrations*
Provisional patent, 09/2013 – 09/2014
Co-Inventors: MA Stremmer (Virginia Tech), **S Basu** (then at Virginia Tech), P Vlachos (Purdue University), GK Nave, Jr. (Colorado School of Mines)
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Invited / Keynote Talks

28. Jadavpur University – Department of Mechanical Engineering, 04/2024, Kolkata, India
27. Indian Institute of Science (IISc) – Department of Mechanical Engineering, 08/2023, Bangalore, India
26. Nitte Meenakshi Institute of Technology (NMIT), 08/2023, Bangalore, India
25. Indian Institute of Technology (IIT) Madras – Department of Applied Mechanics, 08/2023, Chennai, India
24. IIT Bombay – Department of Mechanical Engineering, 03/2023, Mumbai, India
23. Translational Research Institute, 03/2023, Brisbane, Australia
22. Cambridge Design Partnership (a product design consulting company in Raleigh NC), 11/2022, Online

21. US National Congress of Theoretical and Applied Mechanics, External Biofluids Session, 06/2022, Austin, TX
 20. IIT Ropar – Department of Mechanical Engineering, 04/2022, Ropar, India
 19. University of Virginia, NSF PREPARE RAPID PI meeting, 12/2021, Online
 18. University of Illinois at Urbana-Champaign – Department of Mechanical Science & Engineering, 10/2021, Online
 17. Dr. Ferrer Biopharma-sponsored event in Dominican Republic for local clinicians, 07/2021, Online | [Recorded talk](#)
 16. Santa Clara University – School of Engineering, 03/2021, Online
 15. South Dakota State University – College of Pharmacy, 02/2021, Online
 14. The Mechanics Discussions Series, 02/2021, Online | [Recorded talk](#)
 13. National Institute of Technology (NIT) Silchar ASME Chapter – 02/2021, Online
 12. Jadavpur University – Department of Mechanical Engineering, 02/2021, Online
 11. UNC Chapel Hill – School of Medicine, 12/2020, Online
 10. Texas Tech University – Department of Mechanical Engineering, 03/2020, Lubbock, TX
 9. Cornell University – Department of Biological and Environmental Engineering, 02/2020, Ithaca, NY
 8. Society for Computational Fluid Dynamics of the Nose & Airway Meeting, 06/2019, Chicago, IL
[Prior to SDSU]
 7. University of Florida – Department of Mechanical and Aerospace Engineering, 05/2018, Gainesville, FL
 6. South Dakota State University – Department of Mechanical Engineering, 04/2018, Brookings, SD
 5. IIT Delhi – Department of Applied Mechanics, 02/2018, New Delhi, India
 4. UNC Chapel Hill – Department of Otolaryngology / Head & Neck Surgery, 11/2015, Chapel Hill, NC
 3. Brown University – School of Engineering, 04/2015, Providence, RI
 2. Okinawa Institute of Science and Technology, 02/2014, Okinawa, Japan
 1. Jadavpur University – Department of Civil Engineering, 02/2012, Kolkata, India
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Teaching

- As **Assistant Professor** (Department of Mechanical Engineering, South Dakota State University)
 - **Engineering Mechanics in Biomedical Applications**
 - * Semesters: Fall 2023, Fall 2022, Fall 2021, Fall 2020, Fall 2019
 - * Course: ME 446 (undergraduate) / ME 546 (graduate); class size \approx 20 students
 - * Material: Application of statics, dynamics, solid mechanics, and fluid mechanics in biomedical sciences
 - * Duties: Syllabus development, classroom instruction, lecture development, guest lecture arrangement, preparing exams, structuring assignments, grading exams, supervising teaching assistants
 - **Mechanical Engineering Design Technologies – Introduction to MATLAB**
 - * Semesters: Spring 2024, Fall 2023, Spring 2023, Fall 2022, Spring 2022, Fall 2021, Spring 2021 ([online](#)), Fall 2020 ([online](#)), Spring 2020 ([hybrid](#)), Fall 2019, Spring 2019
 - * Course: ME 212/212L (undergraduate); class size \approx 60 students
 - * Material: Introducing MATLAB computing to the freshman / sophomore mechanical engineering students
 - * Duties: Syllabus development, classroom instruction, lecture development, preparing exams, structuring assignments, grading exams, supervising teaching assistants

- As **Instructor during postdoc years** (UNC/NC State University Joint Dept. of Biomedical Engineering)
 - **Skeletal Biomechanics**
 - * Semester: Fall 2018
 - * Course: BMME 505; class size 30 students
 - * Material: Application of statics, dynamics, and solid mechanics in human biomechanics problems
 - * Duties: Classroom instruction, lecture development, preparing exams, structuring assignments, grading exams, supervising a teaching assistant
 - **Statics**
 - * Semester: Fall 2017
 - * Course: BMME 160; class size 27 students
 - * Duties: Classroom instruction, lecture development, preparing exams, structuring assignments, grading exams, supervising a teaching assistant
- As **(solo) Instructor during Ph.D. years** (Department of Engineering Science & Mechanics, Virginia Tech)
 - **Statics**
 - * Semester: Spring 2014
 - * Course: ESM 2104; class-size 70 students
 - * Duties: Classroom instruction, developing lectures & exams, grading exams, supervising teaching assistant
 - **Fluid Mechanics I and II**
 - * Semester: Summer I and II, 2012
 - * Course: ESM 3015, 3016; class size 15–20 students
 - * Duties: Classroom instruction, lecture development, grading
 - **Fluid Mechanics Lab**
 - * Semesters: Spring 2013, Fall 2012, Spring 2011
 - * Course: ESM 3034; 15–20 students
 - * Duties: Supervision of wet lab work, instruction on theoretical concepts, grading
- As **Graduate Teaching Assistant** (Engineering Science and Mechanics, Virginia Tech)
 - **Statics** (ESM 2104; Fall 2009)
 - **Mechanics of Deformable Bodies** (ESM 2204; Spring 2010)
- **Guest Lectures:** On **Nonlinear Dynamics** to Ph.D. students and Postdocs (Spring 2016, OIST, Japan)
- **Teaching Development Course:** Preparing Future Professoriate (GRAD 5104, Spring 2013, Virginia Tech)

Mentorship and Research Supervision

- M.S. completed = 2
Ph.D. ongoing = 3 | Postdoc mentored = 1 (completed)
- **Graduations (at SDSU):**
Abir Malakar (M.S., Spring 2024, **Topic:** Modeling of particle transport inside airway and indoors, [Thesis link](#))
Mohammad Akash (M.S., Spring 2023, **Topic:** Intranasal drug delivery and disease transmission, [Thesis link](#))

- **Ph.D. advisory committee chair (at SDSU):**
 - Mohammad Akash (Mechanical Engineering, projected defense timeline: 2025)
 - Mohammad Yeasin (Mechanical Engineering, projected defense timeline: 2028)
 - Md Tariqul Hossain (Mechanical Engineering, projected defense timeline: 2029)
- **M.S. advisory committee chair (at SDSU):**
 - Mohammad Akash (Mechanical Engineering, defended: Spring 2023)
 - Abir Malakar (Mechanical Engineering, defended: Spring 2024)
- **Ph.D. advisory committee member (at SDSU):**
 - Ashley Jorgensen (Mechanical Engineering, defended: Summer 2024)
 - Mohamed Benhelloun Touimi (Mechanical Engineering, projected defense timeline: 2025)
- **M.S. advisory committee member (at SDSU):**
 - Marcus Goodfellow (Nursing, defended: Spring 2023)
 - Logan Wolf (Mechanical Engineering, defended: Spring 2024)
 - Shafeeqa Irfan (Dairy Science, projected defense timeline: Fall 2024)
- **Graduate / postdoctoral research advising (at SDSU)**
 1. Ph.D. student (started Fall 2024): Md Tariqul Hossain | **Topic:** Particle dynamics in respiratory domain
 2. Ph.D. student (started Fall 2023): Mohammad Yeasin | **Topic:** Physiological vortex dynamics
 3. Ph.D. candidate (started Spring 2021): Mohammad Akash | **Topic:** Flow physics in cancer
 4. M.S. graduate (Fall 2022 – Spring 2024, next: **Ph.D. position with graduate research assistantship at Virginia Tech**): Abir Malakar | **Thesis title:** Computational and experimental modeling of particle transport inside respiratory pathways and indoor environments
 5. M.S. graduate (Spring 2021 – Spring 2023, next: **Ph.D. position with graduate research assistantship at the Basu Lab at SDSU**): Mohammad Akash | **Thesis title:** Modeling of transport in anatomic respiratory airways: applications in targeted drug delivery and airborne pathogenic transmissions
 6. Postdoctoral scholar (Spring 2023 – Fall 2023, next: **Engineer at Dexcom**): Dr. Azadeh Borojeni | **Topic:** Nasal spray modeling for different device parameters
- **Undergraduate research advising (at SDSU)**
 1. U.G. student (Spring 2024 – Present): William O'Connell | **Topic:** Experimental testing of transport in CT-based 3D-printed respiratory cavities
 2. U.G. student (Fall 2023 – Present): Emma Louwagie | **Topic:** Statistical modeling of anatomic transport
 3. U.G. student (Spring 2023 – Present; supported by the [Future Innovators of America \(FIA\) Fellowship](#), from the SDSU College of Engineering): Dominic Winstead | **Topic:** Computational modeling of respiratory transport
 4. U.G. student (2023): Alison Hall | **Topic:** Scaling analysis of transport through anatomic channels
 5. U.G. student (2022): Chidera Ezugu | **Topic:** Modeling physiologic transport in open circulatory systems
 6. U.G. student (2021): Majed Diab | **Topic:** Modeling particle filtration in face masks
 7. U.G. student (2020): Ashley Jorgensen | **Topic:** Conceptualizing air filter designs from animal noses
 8. Remote intern (2021, 2022): Sneham Das | **Topic:** Modeling transport in anatomy-inspired T-junction cavities
 9. Remote intern group (2021): Kanad Sen, Nirnimesh De | **Topic:** Drop impact on soft surfaces
 10. Remote intern (2020, 2021): Aneek Chakraborty | **Topic:** Design of bio-inspired masks for COVID-19
 11. Remote intern group (2021): Abir Malakar, Antu Acharya, Biswajit Majumdar, Sk Mainuddin, Debayan Ghosh | **Topic:** Spatial modeling for airborne pathogen transmission
 12. Remote intern (2020, 2021): Nilotpall Chakraborty | **Topic:** Modeling perfusion through solid tumors

13. Senior Design Teams at SDSU (2019, 2020, 2021, 2022, 2023, 2024) | **Topics:** (a) Cardiopulmonary resuscitation simulator; (b) O₃-based sanitization device; (c) Design of cost-effective prosthetic legs; (d) 3D-printing of human airway cavities
 14. Senior Design Teams from Boston University, co-advised (2021, 2022) | **Topic:** In silico prototyping for an intranasally administered agent for COVID-19 prophylaxis and treatment | [Recorded student presentation](#)
- **Middle / High School outreach and other related activities (at SDSU)**
 1. NSF-sponsored high school outreach camp for Native American institutions (2024)
 2. Dakota Dreams Summer Camp for middle school students (2022, 2023)
 3. Youth Engineering and Technology Summer Camp for high school students (2023)
 4. Judge, Eastern South Dakota Science and Engineering Fair (2022)
 5. GEMS Ready, SET, Go! workshop for middle school female students (2019)
 - Research mentor to **UNC Chapel Hill** medical residents and students on research rotations (04/2016 – 12/2018)
 - Training mentor to a rhinology research technician (Nichole Witten, **UNC Chapel Hill**, 06/2016 – 05/2017)
Areas: 3D digital model development from CT imaging data, CFD simulations of respiratory transport
 - Research mentor to a mechanical engineering sophomore student (Sara Winter, **Virginia Tech**, Summer 2012)
Program: NSF Emerging Frontiers in Research & Innovation (EFRI) – Research Experience & Mentorship
Topic: Modeling open-circulatory transport in insects | **Output:** Presentation at NSF Grantees' Conference
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Experimentation Experience

- Table-top experiments on sprayed/injected liquid media penetration in 3D-printed nasal cavity casts
 - Vortex-induced vibration experiments in 2D (soap films) and 3D (water tunnel) systems
 - Particle image velocimetry experiments (on soap films)
 - Instructed undergraduate Fluid Mechanics Lab classes at Virginia Tech
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Computational and Digital Resources

- Scientific Software – ANSYS Fluent, ICEM CFD, Simulink, SolidWorks, Mimics, FieldView
 - Scripting Languages – Wolfram Mathematica, MATLAB, ANSYS-APDL
 - Programming Languages – FORTRAN, C
 - Documentation / Graphics – L^AT_EX, Beamer, Adobe Illustrator, Adobe Photoshop
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Service

- **Grant Proposal Reviewer:**
 1. NSF ENG and TIP panels (Fluid Dynamics, Engineering Research Center, SBIR/STTR Panels; 2020 – Present)
 2. NIH EMS panels (R01 Study Section; 2022 – Present)
 3. GENUS DSI-NRF panel (National Research Foundation, South Africa; 2023)
 4. UNC Chapel Hill School of Medicine – Otolaryngology Internal Grant Proposal Review Panel (2021)

- **Peer Reviewer:**

1. Physics of Fluids
2. Journal of Mathematical Physics
3. Fluid Dynamics Research
4. Journal of Fluids Engineering
5. Experimental and Computational Multiphase Flow
6. PLOS One
7. PLOS Computational Biology
8. Scientific Reports
9. Medical Engineering and Physics
10. The Laryngoscope
11. JAMA Network Open
12. Journal of Biomechanics
13. Computers in Biology and Medicine
14. Meccanica
15. International Forum of Allergy and Rhinology
16. International Journal for Numerical Methods in Biomedical Engineering
17. Energies
18. Nonlinear Science
19. Engineering Computations
20. Biomechanics and Modeling in Mechanobiology
21. Computer Methods in Biomechanics and Biomedical Engineering
22. Computer Modeling in Engineering and Sciences
23. Applied Sciences
24. Journal of Nonlinear, Complex and Data Science
25. Design of Medical Devices Conference (responsibility: reviewing contributed conference papers)
26. Eastern South Dakota Science and Engineering Fair (responsibility: judging contributed posters)

- **Editorial Roles:**

1. Guest Editor (2021) for “Aerosol Transport in the Biological and Environmental Fluids” special issue at [Fluids](#)
2. Guest Editor (2022) for “Respiratory Biomechanics” special issue at [Frontiers in Bioengineering & Biotechnology](#)
3. Editorial Board Member (2023 – Present) at [Frontiers in Medical Engineering](#)
4. Topic Editor (2024) for “Computational Fluid Dynamics in ENT and Pulmonary Medicine” special issue at [Frontiers in Medical Engineering](#)
5. Topic Editor (2024) for “Translating biomechanics of the human airways for classification, diagnosis, and treatment of pulmonary diseases” special issue at [Frontiers in Physiology](#)

- **Member, Faculty Search Committee** (2022, 2023, 2024): SDSU Department of Mechanical Engineering

- **Member, College Research Council** (01/2023 – Present): SDSU Jerome J Lohr College of Engineering

- **Member, Mechanical Engineering Ph.D. Qualifying Examination Committee at SDSU** (2022 – Present): In-charge of the Fluid Mechanics content

- **Faculty Advisor** (08/2022 – Present): **Biomedical Engineering Society (BMES)** Chapter at SDSU. Supervised the reinstatement of SDSU to the national chapter status in Fall 2023.
 - **Elected College of Engineering Representative** (04/2019 – 04/2020): **Faculty Senate** at SDSU
 - **IIT Ropar MoU**: Facilitated signing of a *Memorandum of Understanding* for academic exchange between SDSU and IIT Ropar, India (formalized in 04/2022; [read media story](#))
 - **US-India Partnership**: Represented SDSU at the [White House](#), on invitation from President Biden, for the formal State Arrival Ceremony of India's Prime Minister Narendra Modi (06/2023); [read media story](#)
 - **Chair, Planning Postdoc Sub-Committee** (2017): **Smithies Annual Nobel Symposium**, UNC Chapel Hill
 - **Elected Class Representative** (2005 – 2006): Department of Civil Engineering, Jadavpur University, India
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Professional Memberships

- **Regular Member** (2014 – Present) | **Student Member** (2010 – 2014): **American Physical Society (APS)**
 - **Faculty Advisor and Member** (2022 – Present): **Biomedical Engineering Society (BMES)**
 - **Nominated Member** (2023 – Present): **Order of the Engineer**
 - **Nominated Member** (2020 – 2021): **Sigma Xi – Scientific Research Honor Society**
 - **Early Career Member** (2017 – 2019): **International Society for Aerosols in Medicine (ISAM)**
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Basu's Undergraduate Research Stints

Summer 2008	Research Intern German Aerospace Center (DLR in Braunschweig, Germany) Institute of Composite Structures and Adaptive Systems, German Aerospace Center Area: Finite volume modeling for active structural acoustic control
Summer 2007	Jawaharlal Nehru Center for Advanced Scientific Research (JNCASR) Fellow Assigned to the Physics Unit, The Institute of Mathematical Sciences (Chennai, India) Area: Theoretical analysis of ciliated torus mechanics at low Reynolds numbers

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Basu Lab Website

