

CURRICULUM VITAE

NAME : SOMNATH BHATTACHARYA

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QUALIFICATION	SCHOOL/COLLEGE	BOARD	YEAR
10 th	Sri Aurobindo Institute of Education, Kolkata.	I.C.S.E.,New Delhi	1995
12 th	Sri Aurobindo Institute of Education, Kolkata.	I.S.C.,New Delhi	1997
QUALIFICATION	INSTITUTE/UNIVERSITY		YEAR
<i>B.TECH.</i> (MANUFACTURING ENGINEERING)	<i>NATIONAL INSTITUTE OF FOUNDRY AND FORGE TECHNOLOGY</i> (NOW <i>NATIONAL INSTITUTE OF ADVANCED MANUFACTURING TECHNOLOGY</i>) , <i>RANCHI UNIVERSITY</i> , RANCHI		2003
<i>M.TECH.</i> (MECHANICAL ENGINEERING-CAD/CAM & MACHINE DESIGN)	<i>NIRMA UNIVERSITY OF SCIENCE AND TECHNOLOGY</i> , AHMEDABAD		2008
<i>AMIE</i> (SECTION-B OF MECHANICAL ENGINEERING WITH SPECIALIZATION IN ENGINEERING DESIGN)	<i>THE INSTITUTION OF ENGINEERS (INDIA)</i>		2010
<i>PH.D.</i> (MECHANICAL ENGINEERING-COMPUTATIONAL MECHANICS)	<i>INDIAN INSTITUTE OF TECHNOLOGY ROORKEE</i>		2012

Languages Known : English, Bengali, Hindi.

Softwares Known : ANSYS, ABAQUS & MATLAB.

Subjects of Interest :

- (i) Solid Mechanics.
- (ii) Continuum Mechanics and Theory of Elasticity and Plasticity.
- (iii) Finite Element Methods, Extended Finite Element Method, Meshfree Methods.
- (iv) Design and Optimization of Machine Elements and Mechanical Systems.
- (v) Computer-Aided Mechanical Design.
- (vi) Vibration Analysis.
- (vii) Advanced Dynamics.

Vocational Training during B.TECH. :

- 4 Weeks Observational Training at Foundry Forge Plant, Heavy Engineering Corporation Limited, Ranchi.
- Industrial visit to Tata Motors Limited, Jamshedpur, Jharkhand.

B.TECH. Project : Computational Method for determining Process Capability using The Six-Sigma approach.

Seminar Topic in B.TECH. : Total Quality Management.

A.M.I.E. (Mechanical Engineering) Project : A Rapid Engineering Framework for Plastic Injection Molding.

Vocational Training During M.Tech. : Design and Working of Plastic Injection Molding Machine at Ferromatik Milacron India Limited, Vatva, Ahmedabad.

Seminars Delivered in M.Tech. :

- (1) Methods of Estimating Life of Heat Exchangers by Fracture Mechanics Approach (Semester One).
- (2) Methods for Automated Assembly of a Stapler Machine (Semester Two).

M.Tech. Dissertation : *Design and Analysis of the Critical Components of a Vertical Machining*

Centre (VMC)—The major components taken into design consideration are the spindle, the all screws and the guide ways.

Ph.D. Dissertation:

Numerical Simulation of Fatigue Failure in Functionally Graded Materials using XFEM –In this work fatigue crack propagation in functionally graded materials (FGM) is investigated using the extended finite element method (XFEM). The FGM is composed of aluminum alloy and ceramic (alumina) with a gradation from one side to the other. The fatigue crack propagation of a major edge and center crack under mode-I, mixed mode and thermal cyclic loadings is studied and compared in the FGM, an equivalent composite consisting of the same volume fractions of aluminum alloy and the ceramic and the aluminum alloy using XFEM. The effect of the presence of minor discontinuities like minor cracks, holes/voids and inclusions on the fatigue life of all these three materials is explored. In separate problems fatigue crack propagation of interfacial edge/center crack in a bi-material consisting of an FGM and the aluminum alloy is also simulated under the cyclic loading conditions as mentioned using XFEM.

Achievements/Awards:

- (1) Secured 85.9 percentile in GATE 2003 with an A.I.R. 345
(Production & Industrial Engineering).
- (2) Scored 356 in GATE 2006 with an A.I.R. 2401
(Mechanical Engineering).
- (3) Secured 1st Class with Distinction in M.Tech. (Mechanical Engineering—CAD/CAM) from Nirma University.
- (4) **Award for the best paper in the *International Conference on Mechanical, Civil and Architectural Engineering (ICMCAE)*, Kuala Lumpur, Malaysia, February 19-20, 2014** (Organized by IISRO).

Membership of Professional

Associate Member of The Institution of Engineers (India) (**AM126331-8**).

Body:

Experience in Teaching:

- *Worked as Assistant Professor (Grade-2, AGP 7000/-) in Mechanical Engineering Department, National Institute of Technology Raipur from 14/05/2013 till 11/06/2018.*
- *Worked as Assistant Professor (Grade-1, AGP 8000/-) in Mechanical Engineering Department, National Institute of Technology Raipur from 12/06/2018 till 21/10/2022.*
- *Working as Associate Professor (AGP 9500/-) in Mechanical Engineering Department, National Institute of Technology Raipur from 22/10/2022 till date.*

Short Term Courses/Training Programmes Organized:

- Five days TEQIP-III sponsored Short Term Training Programme on *Advanced Techniques in Multi-scale Materials Modeling* from 9th to 13th November 2017 at NIT Raipur, Raipur.

Continuing Education/QIP Short Term Lectures/Special Lecturers/Courses:

- Delivered an expert lecture on ‘*Applications of MATLAB in Numerical Computing*’ in one week STTP on ‘*Modeling Using Computational Fluid Dynamics and MATLAB*’ under Continuing Education Cell from 27th June to 1st July, 2016 in Department of Chemical Engineering, NIT Raipur.
- Delivered an expert lecture on ‘*Applications of Finite Elements in Material Modeling*’ in a two day workshop on ‘*Emerging Trends in Materials-A National Perspective*’ under TEQIP-II organized from 23rd September till 24th September, 2016 in Department of Metallurgical Engineering, NIT Raipur.
- Delivered an expert lecture on ‘*CAD/CAM and their Integration*’ in One Week Self-Financed Short Term Training Programme on *CNC Programming and Practices* organized from 10th October till 14th October, 2017 in Department of Mechanical Engineering, NIT Raipur.
- Delivered an expert lecture on ‘*Applications of XFEM in Fracture Mechanics*’ in an invited lecture session at Nirma University of Science and Technology, Ahmedabad on 17th November, 2017.

International Workshops/STTP Attended/ Participated:

- Two Day International Workshop on “*Exploring the Science of Transportation Systems*” from 11th to 12th April 2013 held at NIT Hamirpur, Hamirpur, Himachal Pradesh.
- Four Day TEQIP Workshop “*Pravartana 2013: Workshop on Applied Mechanics*” from 4th to 7th October 2013 held at IIT Kanpur, Kanpur, Uttar Pradesh.
- Seven Day TEQIP Workshop “*Parvartana 2014: TEQIP Workshop on Mechanics and Applied Mathematics*” 19th to 25th July 2014 held at IIT Kanpur, Kanpur, Uttar Pradesh.
- Participated as a member of the organizing committee in One week STTP on ‘*Experimental and Computational Fluid Mechanics for Engineering and Basic Sciences (ECFMEBS-2016)*’ held from 7th November to 11th November, 2016 in Department of Mechanical Engineering, NIT Raipur.
- Participated as a member of the organizing committee in One week STTP on ‘*Applications of Research Methodology, Tools and Techniques (ARMTT-2016)*’ held from 21st November to 25th November, 2016 in Department of Mechanical Engineering, NIT Raipur.

PUBLICATIONS

Publications in International Journals

I. V. Singh, B. K. Mishra and **S. Bhattacharya**, XFEM Simulation of Cracks, Holes and Inclusions in Functionally Graded Materials, *International Journal of Mechanics and Materials in Design*, Vol. 7, pp. 199-218, **2011**.

I. V. Singh, B. K. Mishra, **S. Bhattacharya** and R. U. Patil, The Numerical Simulation of Fatigue Crack Growth Using Extended Finite Element Method, *International Journal of Fatigue*, Vol. 36, pp. 109-119, **2012**.

S. Bhattacharya, I. V. Singh and B. K. Mishra, Fatigue Life Estimation of Functionally Graded Materials using XFEM, *Engineering With Computers* Vol. 27, pp. 427-448, **2013**.

S. Bhattacharya, I. V. Singh, B.K. Mishra and T.Q. Bui, Fatigue Crack Growth Simulations of Interfacial Cracks in Bi-layered FGMs using XFEM, *Computational Mechanics*, Vol. 52, pp. 799-814, **2013**.

S. Bhattacharya, I. V. Singh and B.K. Mishra, Mixed Mode Fatigue Crack Growth Analysis of Functionally Graded Materials by XFEM, *International Journal of Fracture* Vol.183, pp. 81-97, **2013**.

S. Bhattacharya, I. V. Singh and B. K. Mishra, Fatigue Life Simulation of Functionally Graded Materials under Cyclic Thermal Load Using XFEM, *International Journal of Mechanical Sciences* Vol. 82, pp. 41-59, **2014**.

S. Bhattacharya, G. Pammani, S. Sanyal and K. Sharma, Numerical Simulation of Crack Propagation Under Fatigue Loading in Piezoelectric Material Using Extended Finite Element Method, *International Journal of Computational Materials Science and Engineering*, Vol. 4, No. 4, **2015**.

M. Pant and **S. Bhattacharya**, Fatigue Crack Growth Analysis of Functionally Graded Materials by EFGM and XFEM, *International Journal of Computational Methods*, Vol. 14, No. 1, 1750004 (33 pages), **2016**.

S. Bhattacharya, K. Sharma, and V. Sonkar, Numerical Simulation of Elastic Plastic Fatigue Crack Growth in Functionally Graded Material Using the Extended Finite Element Method, *Mechanics of Advanced Materials And Structures*, Vol. 24, No. 16, pp. 1367-1380, **2016**.

Agnivesh Kumar Sinha, H. K. Narang and **S. Bhattacharya**, Mechanical Properties of Natural Fibre Polymer Composites, *Journal of Polymer Engineering*, DOI 10.1515/polyeng-2016-0362, **2017**.

G. Pammani, **S. Bhattacharya** and S. Sanyal, Analysis of Semipermeable Crack Growth in Piezoelectric Materials using Extended Finite Element Method, *International Journal of Applied Mechanics*, Vol. 9, No. 7, 1750106 (23 pages), **2017**.

G. Pammani, **S. Bhattacharya** and S. Sanyal, Analysis of Interface Crack in Piezoelectric Materials Using Extended Finite Element Method, *Mechanics of Advanced Materials And Structures*, <https://doi.org/10.1080/15376494.2018.1432817>, **2018**.

Agnivesh Kumar Sinha, **S. Bhattacharya** and H. K. Narang, Experimental determination and modeling of the mechanical properties of hybrid abaca-reinforced polymer composite using RSM, *Polymer and Polymer Composites*, DOI: 10.1177/0967391119855843, **2019**.

G. Pammani, **S. Bhattacharya** and S. Sanyal, Numerical Simulation of Tri-layer Interface Cracks in Piezoelectric Materials using Extended Finite Element Method, *Iranian Journal of Science and Technology, Transactions of Mechanical Engineering*, <https://doi.org/10.1007/s40997-019-00307-x>, **2019**.

Vaibhav Sonkar, **S. Bhattacharya** and K. Sharma, A Three Dimensional Fracture Analysis of an Edge Crack in FGM Using XFEM, *Materials Science Forum*, Vol. 969, pp 315-320, **2019**.

Agnivesh Kumar Sinha, H. K. Narang and **S. Bhattacharya**, Experimental Investigation of Surface Modified Abaca Fiber, *Material Science Forum* Vol. 978, pp.291-295, **2020**.

Agnivesh Kumar Sinha, H. K. Narang and **S. Bhattacharya**, A Fuzzy Logic Approach for Modelling And Prediction of Mechanical Properties of Hybrid Abaca-Reinforced Polymer Composite, *Journal of the Brazilian Society of Mechanical Sciences and Engineering*, <https://doi.org/10.1007/s40430-020-02377-4>, **2020**.

Agnivesh Kumar Sinha, H. K. Narang and **S. Bhattacharya**, Mechanical Properties of Hybrid Polymer Composites: A Review, *Journal of the Brazilian Society of Mechanical Sciences and Engineering*, <https://doi.org/10.1007/s40430-020-02517-w>, **2020**.

Agnivesh Kumar Sinha, H. K. Narang, **S. Bhattacharya** and A.K. Khatri, Effect of SiC on Structure and Property of 2017 Aluminium Alloy, *Advances in Materials and Processing Technologies*, <https://doi.org/10.1080/2374068X.2020.1800311>, **2020**.

Agnivesh Kumar Sinha, H. K. Narang and **S. Bhattacharya**, Experimental Determination, Modelling and Prediction of Sliding Wear of Hybrid Polymer Composites using RSM and Fuzzy Logic, *Arabian Journal for Science and Engineering*, <https://doi.org/10.1007/s13369-020-04997-3>, **2020**.

Agnivesh Kumar Sinha, **S. Bhattacharya** and H. K. Narang, Abaca Fibre Reinforced Polymer Composites: A Review, *Journal of Materials Science*, <https://doi.org/10.1007/s10853-020-05572-9>, **2020**.

V. Sonkar , **S. Bhattacharya** and K. Sharma, Numerical Simulation of Three Dimensional Fracture Mechanics Problems of Functionally Graded Pipe and Pipe Bend Using XFEM, *Iranian Journal of Science and Technology, Transactions of Mechanical Engineering*, <https://doi.org/10.1007/s40997-021-00470-0>, **2022**.

Vaibhav Sonkar, **S. Bhattacharya** and K. Sharma, Three dimensional extended finite element method simulation of cracked functionally graded pipe and pipe bend, *Part C: Journal of Mechanical Engineering Science*, DOI: 10.1177/09544062221091522, **2022**.

S. Kumar, **S. Bhattacharya** and A.K. Baghel, An experimental study of the response characteristics of end milling operations and their finite element simulation, *Journal Process Mechanical Engineering*, DOI: 10.1177/09544089241282122, **2024**.

Dinesh Deshmukh, **S. Bhattacharya** and S. Sanyal, A comparative study of object detection techniques for identifying biomedical waste, *International Journal of Bioinformatics Research and Applications*, (accepted) **2024**.

Publication in National Journal

Kamal Sharma, **Somnath Bhattacharya** and Vaibhav Sonkar, XFEM simulation on Mixed-Mode Fatigue Crack Growth of Functionally Graded Materials, *Journal of Mechanical Engineering and Biomechanics*, Volume 1 Issue 1, Page 46-55, **2016**.

Book Chapter Published

Somnath Bhattacharya, Kamal Sharma and Vaibhav Sonkar, Fatigue Fracture of Functionally Graded Materials under Elastic-plastic Loading Conditions Using Extended Finite Element Method, *Book: Contact and Fracture Mechanics*, (ISBN 978-953-51-5723-6), *INTECHOPEN*, **2017**.

Sponsored Research Projects

Sl. No.	Title of the Project	Funding Agency	Financial Outlay (INR in Lakhs)	Year (Status)	Investigators
1	Design analysis of adhesively bonded composite patch repair of cracked aluminum aircraft panels.	ARDB (DRDO)	14.34	09/07/2019 to 08/07/2021 (Completed)	Dr. H. Pathak (PI) and Dr S. Bhattacharya (Co-PI)
2	Experimental and Numerical Investigation of Fatigue Delamination Behaviour in Composite Laminates under Thermal Loading	ARDB (DRDO)	39.24	09/09/2024 to 08/09/2027 (Ongoing)	Dr S. Bhattacharya (PI), Dr. R.K. Sahu(Co-PI) and Dr. H. Pathak (Co-PI) and
3.	Design and development of self-healing polymer nanocomposite pressure sensors for aerospace applications	ARDB (DRDO)	39.96	19/07/2024 to 18/07/2024 (ongoing)	Dr. R.K. Sahu (PI), Dr S. Bhattacharya (Co-PI) and Dr. H. Pathak (Co-PI) and

Doctoral Thesis Supervised

Name of Scholar (PT/FT)	Role (Singly/Jointly)	Year of Completion	Title of Thesis	Status
<i>Gulab Pamnani (PT)</i>	<i>Main Supervisor (Jointly)</i>	2019	<i>FRACTURE & FATIGUE ANALYSIS OF CRACKED PIEZOELECTRIC PLATES USING XFEM</i>	<i>Awarded</i>
<i>Agnivesh Kumar Sinha (FT)</i>	<i>Joint Supervisor (Jointly)</i>	2019	<i>DEVELOPMENT AND CHARACTERIZATION OF HYBRID ABACA-EPOXY COMPOSITES</i>	<i>Awarded</i>
<i>Vaibhav Sonkar (FT)</i>	<i>Main Supervisor (Jointly)</i>	2023	<i>FRACTURE ANALYSIS OF CRACKED FGM PLATES, PIPES & PIPE BENDS USING XFEM</i>	<i>Awarded</i>
<i>Dinesh Deshmukh (PT)</i>	<i>Main Supervisor (Jointly)</i>	----		<i>Ongoing</i>
<i>Ravi Tiwari (FT)</i>	<i>Main Supervisor (Jointly)</i>	----		<i>Ongoing</i>
<i>Ritesh Patel (FT)</i>	<i>Main Supervisor</i>	----		<i>Ongoing</i>

Publications in International Conferences/Symposium:

Agnivesh Kumar Sinha, H. K. Narang, **S. Bhattacharya** and A.K. khatri, Influence of Mild Alkali Treatment on Abaca Fibre, ICMMRE 2019: 2nd International Conference on Mechanical Materials and Renewable Energy, AIP Conference Proceedings 2273, 050014-1–050014-4, <https://doi.org/10.1063/5.0024346>, **2020**.

Agnivesh Kumar Sinha, H. K. Narang and **S. Bhattacharya**, Experimental Investigation of Surface Modified Abaca Fiber, ICPCM-2018: 1st International Conference on Processing and Characterization of Materials, NIT Rourkela, December 6th -8th, **2018**.

Vaibhav Sonkar, **S. Bhattacharya** and K. Sharma, XFEM Simulation of an Edge Cracked 3D Functionally Graded Cuboid, AIP Conference Proceedings 2220, 140001; <https://doi.org/10.1063/5.0001785>, **2020**.

Vaibhav Sonkar, **S. Bhattacharya** and K. Sharma, A Three Dimensional Fracture Analysis of an Edge Crack in FGM Using XFEM, ICRAMMT 2018: International Conference on Recent Advances in Materials and Manufacturing Technologies, Marri Laxman Reddy Institute of Technology & Management, Hyderabad, India, November 19th -20th, **2018**.

Agnivesh Kumar Sinha, H. K. Narang and **S. Bhattacharya**, Characterization and Analysis of Surface Modified Abaca Fibre, ICRAMMT 2018: International Conference on recent Advances in Materials and Manufacturing Technologies, Marri Laxman Reddy Institute of Technology & Management, Hyderabad, India, November 19th -20th, **2018**.

Agnivesh Kumar Sinha, H. K. Narang and **S. Bhattacharya**, Tensile Strength of Abaca Epoxy Laminated Composites, ICCMEMS 2018: International Conference on Composite Materials: Manufacturing, Experimental Techniques, Modeling and Simulation, School of Mechanical Engineering, Lovely Professional University, Punjab, India, March 15th-17th, **2018**; Materials Today Proceedings Vol. 5, pp. 27861-27864, **2018**.

S. Bhattacharya, G. Pammani and S.Sanyal, Analysis of Interface Crack in Piezoelectric Composites Using Extended Finite Element Method, ICCMME 2018: 3rd International Conference on Composite Materials and Material Engineering, National University of Singapore, Singapore, January 26th-28th, **2018**.

S. Bhattacharya, K. Sharma and Vaibhav Sonkar, Study of Elastic-Plastic Fatigue Crack in Functionally Graded Materials, ICMSMME 2017: 19th International Conference on Materials Science, Mechatronics and Mechanical Engineering, Dubai, UAE, June 28th-29th, **2017**.

Agnivesh Kumar Sinha, H. K. Narang and **S. Bhattacharya**, Evaluation of Bending Strength of Abaca Reinforced Polymer Composites, International Conference on Emerging Trends in Materials and Manufacturing Engineering, NIT Tiruchirapalli, Tamil Nadu, India, March 10th -12th, **2017**; Materials Today Proceedings Vol. 5, pp. 7284-7288, **2018**.

M. Pant, K. Sharma and **S. Bhattacharya**, Application of EFGM and XFEM for Fatigue Crack growth Analysis of Functionally Graded Materials, 11th International Symposium on Plasticity and Impact Mechanics, Implast 2016 IIT Delhi, December 11th- 14th, **2016**; Procedia Engineering Vol. 173, pp. 1231-1238, **2017**.

- G. Pamnani, **S. Bhattacharya** and S. Sanyal, XFEM Simulation of Semi Permeable Crack in Piezoelectric Materials, 2nd International Conference on Applied Science Engineering and Technology, Tirupati, Andhra Pradesh, India, 18th-19th October, **2016**.
- Sinha, **Narang** and **Bhattacharya**, Mechanical Characterization of Hybrid Natural Fiber Composite, International Conference on Advances in Functional Materials, Jeju, South Korea, August 8th -11th, **2016**.
- Agnivesh Kumar Sinha, H.K. Narang and **S. Bhattacharya**, Effect of Alkali Treatment on Surface Morphology of Abaca Fibre, International Conference on Advancements in Aeromechanical Materials for Manufacturing, MLRIT, Hyderabad, India, July 7 – 9, **2016**; Materials Today Proceedings Vol. 4, pp. 8993-8996, **2017**.
- S. Bhattacharya** and K. Sharma, Application of XFEM for fatigue crack growth analysis of functionally graded materials under mixed mode loading, 7th International Conference on Creep, Fatigue and Creep – Fatigue Interaction, Indira Gandhi Centre for Atomic Research, Kalpakkam, India, January 19 – 22, **2016**.
- Mohit Pant, K. Sharma and **S. Bhattacharya**, Fatigue crack growth analysis of functionally graded materials by EFGM and coupled FEEFGM, 7th International Conference on Creep, Fatigue and Creep – Fatigue Interaction, Indira Gandhi Centre for Atomic Research, Kalpakkam, India, January 19 – 22, **2016**.
- H. Pathak, **S. Bhattacharya**, A. Singh and I. V. Singh, Simulation of Three Dimensional Cracks in FGM using XFEM, 17th ISME Conference on Advances in Mechanical Engineering, IIT Delhi, India, October 3-4, **2015**.
- Gulab Pamnani, **S. Bhattacharya** and S.Sanyal, XFEM Simulation of Fatigue Crack Propagation in Piezoelectric Materials, 1st International Conference on Advent Trends in Engineering, Science and Technology (ICATEST 2015), 01 March, **2015**.
- S. Bhattacharya** and K. Sharma, Fatigue Crack Growth Simulations of FGM plate under Cyclic Thermal Load by XFEM, 1st International Conference on Structural Integrity, ICONS-2014, Convention Center, Kalpakkam, February 4-7, 2014, Procedia Engineering Vol. 86, pp. 727-731, **2014**.
- S. Bhattacharya**, I. V. Singh and B. K. Mishra, Numerical Simulation of Mechanical and Thermal Fatigue Crack Growth in FGM using XFEM, International Conference on Mechanical, Civil and Architectural Engineering (ICMCAE), Kuala Lumpur, Malaysia, February 19-20, **2014**.
- I. V. Singh, B. K. Mishra and **S. Bhattacharya**, Numerical Simulation of Fatigue Crack Propagation in FGM Using XFEM, ECCOMAS Thematic Conference on XFEM, Cardiff University, Cardiff, UK, June 29–July 1, **2011**.
- S. Bhattacharya**, I. V. Singh and B. K. Mishra, Fatigue Fracture of Functionally Graded Materials using XFEM, 5th International Conference on Theoretical, Applied, Computational and Experimental Mechanics, IIT Kharagpur, India, December 27–29, **2010**.
- S. Bhattacharya**, I. V. Singh, B. K. Mishra, Numerical Simulation of Multiple Crack Problems in FGM Using XFEM, Souvenir of 55th Congress of ISTAM (An International Meet), NIT Hamirpur, HP, India, pp. 57, December 18–21, **2010**.
- S. Bhattacharya** and I. V. Singh, Numerical Simulation of Curved Edge Cracks Using X-FEM, Proc. of the 3rd International Conference on Advances in Mechanical Engineering, S. V. National Institute of Technology, Surat, India, January 4–6, **2010**.

Declaration:

I hereby declare that all the information given in this document is true to the best of my knowledge and belief.

Date:

Place:

(Somnath Bhattacharya)