

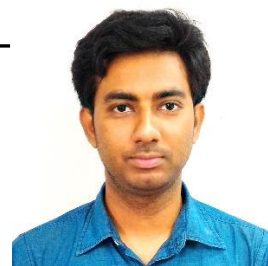
ASHIM PAUL, Ph.D.

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H. No.10, Satyajit Pally, Benachity, Duragpur-713213, Burdwan, West Bengal, India.

ACADEMIC RECORDS

- 03/2021 – present** Postdoctoral Research Associate
Seoul National University, South Korea (*QS ranking 36*)
Research area: Peptide-gold nanoparticle-based therapeutics towards Neurodegenerative diseases.
P.I.- Prof. Ki Tae Nam
- 07/2016 – 03/2021** Postdoctoral Fellow
Tel Aviv University, Israel (*QS ranking 219*)
Research area: Molecular Neuroscience and Biophysical Chemistry.
P.I.- Prof. Daniel Segal
- 02/2019 – 03/2019** Visiting Research Fellow (BIRAX Travel Fellowship)
King's College London, UK (*QS ranking 35*)
Research Area: Small molecule inhibitors towards TDP-43 aggregation in ALS disease.
P.I.- Prof. Annalisa Pastore
- 12/2010– 06/2016** Ph.D. in Chemistry (CPI 8.75 out of 10)
Indian Institute of Technology Guwahati, India (*QS ranking 470; NIRF ranking 8*)
Thesis: Development of New Strategies for Peptide Based Drug Design against Alzheimer's Disease
P.I.- Prof. Bhubaneswar Mandal
- 05/2009– 07/2009** Internship (part of M.Sc. curriculum)
Indian Association for the Cultivation of Science, India
Research Area: Organic synthesis
P.I.- Prof. Saswati Lahiri
- 07/2008– 05/2010** M.Sc. in Chemistry (First Class with Distinction)
Indian School of Mines Dhanbad (Now IIT Dhanbad), India (*NIRF ranking 26*)
Thesis: Corrosion Inhibition of Mild Steel using Thiosemicabazide Derivatives
P.I.- Dr. Mahendra Yadav
- 07/2005– 05/2008** B.Sc. in Chemistry Honours (First Class) with Physics, Mathematics and English
University of Burdwan, West Bengal, India

HONOURS/AWARDS/REVIEWERS

- Guest Editor of a special issue, "Self-Assembling Peptides/Proteins at the Interface of Chemistry and Biology" in *International Journal of Molecular Sciences (IF 5.923), MDPI journal*.
- Guest Editor of a special issue, "Therapeutic Development towards Protein Misfolding Diseases" in *International Journal of Molecular Sciences (IF 5.923), MDPI journal*.
- Topic Editor in *International Journal of Molecular Sciences (IF 5.923), MDPI journal*.
- Invited reviewer in journals: *Nanoscale, Chem. Sci., ACS Chem. Neurosci., ACS Med. Chem. Lett., and Int. J. Mol. Sci.*
- Received Postdoctoral Fellowship-2020/2021 from The Aufzien Family Center for the Prevention and Treatment of Parkinson's Disease (APPD)
- Awarded UK travel fellowship for one month (£2650) in 2018/2019 from British Council (BIRAX Travel Fellowship).
- Awarded winning prize (₹10,000) on innovative research ideas leading to the entrepreneurial venture in biotechnology & allied areas, Assam Biotechnology Conclave, 20-21st November, 2015.
- Received Senior Research Fellowship on Jan, 2013 and Junior Research Fellowship on Jan, 2011 from UGC, India.
- Qualified National Eligibility Test (NET-JRF) June-2011 (UGC-rank 79), Dec-2010 (UGC-rank 476) and June-2010 (UGC-rank 363) in Chemical Science.
- Qualified Graduate Aptitude Test in Engineering (GATE) 2010 in Chemistry (All India rank 793).

PATENTS

- Mandal, B., and **Paul, A.** "Beta Sheet Breaker Peptides for Anti-Alzheimer's Drug Design" an Indian patent application, IPA No. E-2/1727/2015/KOL (complete application filed on the 17th September, 2015); provisional IPA No - 997/KOL/2014 (filed on the 26th September, 2014).
- Mandal, B., and **Paul, A.** "β-Sheet breaker peptides for drug design against Diabetes type-2" an Indian patent application, IPA No. 201631018104 (complete application filed on the 26th May, 2016)-**Patent granted** in 2021 (#362950)

PUBLICATIONS & COMMUNICATIONS

- Abu-Hussein, M., Krishnakumar, V. G., Simhaev, L., **Paul, A.**, Engel, H., Gazit, E., and Segal, D. (2022) The contribution of individual residues of an aggregative hexapeptide derived from the human γD-crystallin to its amyloidogenicity. *Int. J. Biol. Macromol.* **201**, 182-192. (IF-6.953)
- Chakraborty, P., Bera, S., Mickel, P., **Paul, A.**, Shimon, L. J. W., Arnon, Z. A., Segal, D., Král, P., and Gazit, E. (2022) Inhibitor-Mediated Structural Transition in a Minimal Amyloid Model. *Angew. Chem. Int. Ed.* **2022**, 61(3): e202113845. (IF-15.34)
- Mohapatra, S., Viswanathan, G.K.K., Wettstein, L., Arad, E., **Paul, A.**, Kumar, V., Jelinek, R., Münch, J., and Segal, D., (2021) Dual concentration-dependent effect of Ascorbic acid on PAP(248-286) amyloid formation and SEVI-mediated HIV infection. *RSC Chem. Biol.* **2**, 1534-1545. (IF-N/A)
- Paul, A.**, Jacoby, G., Beck, R., Gazit, E., and Segal, D. (2021) Glucosylceramide associated with Gaucher disease forms amyloid-like twisted ribbon fibrils that induce α-Synuclein aggregation. *ACS Nano*. **15** (7). 11854-11868. (IF-15.881)
- Paul, A.**, Krishnakumar, V. G., Huber, A., Arad, E., Engel, H., Jelinek, R., Gazit, E., and Segal, D. (2021) Inhibition of tau amyloid formation and disruption of its preformed fibrils by Naphthoquinone-Dopamine hybrid. *FEBS J.* **288** (14), 4267-4290. (IF-5.542)
- Paul, A.**, Segal, D., and Zacco, E. (2021) Glycans to improve efficacy and solubility of protein aggregation inhibitors. *Neural Regen. Res.* **16** (11), 2215-2216. (IF-5.135)
- Kalita, S., Kalita, S., **Paul, A.**, Shah, M., Kumar, S., and Mandal, B. (2021) Site-Specific Single Point Mutation by Anthranilic Acid in hIAPP₈₋₃₇ Enhances Anti-Amyloidogenic Activity. *RSC Chem. Biol.* **2**, 266-273. (IF-N/A)
- Paul, A.**, Kumar, S., Kalita, S., Kalita, S., Sarkar, D., Bhunia, A., Bandyopadhyay, A., Mondal A. C., and Mandal, B. (2021) An explicitly designed paratope of Amyloid-β prevents neuronal apoptosis in vitro and hippocampal damage in rat brain. *Chem. Sci.* **12**, 2853-2862. (IF-9.825)
- Paul, A.**, Huber, A., Rand, D., Gosselet, F., Cooper, I., Gazit, E., and Segal, D. (2020) Naphthoquinone-Dopamine hybrids inhibit α-synuclein aggregation, disrupt preformed fibrils and attenuate aggregate-induced toxicity. *Chem. Eur. J.* **26**(69), 16486-16496. (IF-5.236)
- Paul, A.**, Frenkel-Pinter, M., Alvarez, D. E., Milordini, G., Gazit, E., Zacco, E., and Segal, D. (2020) Tryptophan-galactosylamine conjugates inhibit and disaggregate amyloid fibrils of Aβ42 and hIAPP peptides while reducing their toxicity. *Commun. Biol.* **3** (1), 484. (IF-6.628)
- Abu-Hussein, M., Krishnakumar, V. G., Haj, E., **Paul, A.**, Gazit, E., and Segal, D. (2020) An amyloidogenic hexapeptide from the cataract-associated γD-crystallin is a model for the full-length protein and is inhibited by naphthoquinone-tryptophan hybrids. *Int. J. Biol. Macromol.* **157**, 424-433. (IF-6.953)
- Kalita, S., Kalita, S., **Paul, A.**, Sarkar, A., and Mandal, B. (2020) Tail-to-Side Chain One Component Peptide Stapling Inhibits Alzheimer's Amyloid-β Fibrillogenesis. *Chem. Sci.* **11**, 4171-4179. (IF-9.825)
- Li, G., Yang, W. Y., Li, W. H., Luo, Y. Y., Lim, Y. J., Li, Y., **Paul, A.**, Segal, D., Hong L., and Li, Y.M. (2020) Rational design of a cocktail of inhibitors against Aβ aggregation. *Chem. Eur. J.* **26**(16), 3499-3503. (IF-5.236)
- Paul, A.**, Li, W. H., Krishnakumar V. G., Arad, E., Mahapatra, S., Li, G., Jelinek, R., Gazit, E., Li, Y. M., and Segal, D. (2019) Tryptophan-Glucosamine Conjugates Modulate Tau-Derived PHF6 aggregation at Low concentrations. *Chem. Commun.* **55** (97), 14621-14624. (IF-6.222)
- Krishnakumar V. G., **Paul, A.**, Gazit, E., and Segal, D. (2019) Naphthoquinone Tryptophan Hybrids: A Promising Small Molecule Scaffold for Mitigating Aggregation of Amyloidogenic Proteins and Peptides. *Front. Cell Dev. Biol.* **7**, 242. (IF-6.684)
- Paul, A.**, Krishnakumar V. G., Mahapatra, S., Balboni, G., Pacifico, S., Gazit, E., and Segal, D. (2019) Antagonistic activity of Naphthoquinone based hybrid molecules towards Alzheimer's and Type-2 diabetes diseases. *ACS Chem. Neurosci.* **10** (8), 3510. (IF-4.418)
- Paul, A.**, Zhang, B. D., Mohapatra, S., Li, G., Li, Y. M., Gazit, E., and Segal, D. (2019) Novel Mannitol-Based Small Molecules for Inhibiting Aggregation of α-Synuclein Amyloids in Parkinson's Disease. *Front. Mol. Biosci.* **6**, 16. (IF-5.246)
- Losev, Y.,[#] **Paul, A.**,[#] Frenkel-Pinter, M., Abu-Hussein, M., Khalaila, I., Gazit, E., and Segal, D. (2019) Novel model of secreted human tau protein reveals the impact of the abnormal N-glycosylation of tau on its aggregation propensity. *Sci. Rep.* **9**, 2254. (*#Equal first author*). (IF-4.379)
- KrishnaKumar, V. G., Mahapatra, S., **Paul, A.**, Gazit, E., and Segal, D. (2018) Inhibitory effect of NQTrp hybrid towards PAP f39 semen amyloid aggregation. *Molecules* **23**(12), 3279. (IF-4.411)
- KrishnaKumar, V. G.,[#] **Paul, A.**,[#] Gazit, E., and Segal, D. (2018) Mechanistic insights into remodeled Tau-derived PHF6 peptide fibrils by Naphthoquinone-Tryptophan hybrids. *Sci Rep.* **8**(1), 71. (*#Equal first author*) (IF-4.379)
- Paul, A.**, Kumar, S., Kalita, S., Ghosh, A. K., Mondal A. C., and Mandal, B. (2018) A Peptide Based Pro-Drug Disrupts Alzheimer's Amyloid into Non-Toxic Species and Reduces Aβ Induced Toxicity in vitro. *Int. J. Pept. Res. Ther.* **24**(1) 201-211. (IF-1.931)
- Giri, R. S., Manne, S. R., Dolai, G., **Paul, A.**, Kalita, T., and Mandal, B. (2017) FeCl₃-Mediated Side Chain Modification of Aspartic Acid- and Glutamic Acid-Containing Peptides on a Solid Support. *ACS Omega* **2**(10), 6586-6597. (IF-3.512)
- Kumar, S., **Paul, A.**, Kumar, A., Hazra, S., Ghosh, A. K., Mondal, B., and Mondal A. C. (2017) A Peptide Based Pro-Drug Ameliorates Amyloid-β Induced Neuronal Apoptosis in In Vitro SH-SY5Y Cells. *Curr. Alzheimer Res.* **14** (12), 1293-1304. (IF-3.498)
- Prasad, S., Mandal, I., Singh, S., **Paul, A.**, Mandal, B., Venkatramani, R., and Swaminathan, R. (2017) Near UV-Visible Electronic Absorption Originating from Charged Amino Acids in a Monomeric Protein. *Chem. Sci.* **8**, 5416-5433. (IF-9.825)

25. Brahmachari, S., **Paul, A.**, Segal, D., and Gazit, E. (2017) Inhibition of amyloid oligomerization into different supramolecular architectures by small molecules: mechanistic insights and design rules. *Future Med. Chem.* **9**(8), 797-810. (IF-3.808)
26. **Paul, A.**, Kalita, S., Kalita, S., Sukumar, P., and Mondal, B. (2017) Disaggregation of Amylin Aggregate by Novel Conformationally Restricted Aminobenzoic Acid containing α/β and α/γ Hybrid Peptidomimetics. *Sci. Rep.* **7**, 40095. (IF-4.379)
27. Kumar, S., **Paul, A.**, Kalita, S., Ghosh, A. K., Mandal, B., and Mondal A. C. (2017) Protective effects of β -sheet breaker α/β -hybrid peptide against amyloid β -induced neuronal apoptosis in vitro. *Chem Biol Drug Des.* **89** (6), 888-900. (IF-2.817)
28. Sharma, B., Kalita, S., **Paul, A.**, Mandal, B. and Paul, S. (2016) The role of caffeine as an inhibitor in the aggregation of amyloid forming peptides: a unified molecular dynamics simulation and experimental study. *RSC Adv.* **6**, 78548-78558. (IF-3.361)
29. Prasad, S., Mandal, I., **Paul, A.**, Mandal, B., Venkatramani, R., Swaminathan, R. (2016) Investigation of Novel Spectroscopic Features in the Near Ultraviolet Region Arising from Non-Aromatic Amino Acids in Peptides and Proteins. *Biophys. J.* **110**, 489a. (IF-4.033)
30. **Paul, A.**, Sharma, B., Mondal, T., Thalluri, K., Paul, S., and Mandal, B. (2016) Amyloid- β Derived Switch-Peptides as a Tool for Investigation of Early Events of Aggregation: A Combined Experimental and Theoretical Approach. *MedChemComm* **7**, 311-316. (IF-3.597)
31. Manne, S. R., Thalluri, K., Giri, R. S., **Paul, A.**, and Mandal, B. (2015) Racemization free longer N-terminal peptide hydroxamate synthesis on solid support using ethyl 2-(tert-butoxycarbonyloxyimino)-2-cyanoacetate. *Tetrahedron Lett.* **56**, 6108-6111. (IF-2.415)
32. **Paul, A.**, Nadimpally, K. C., Mondal, T., Thalluri, K., and Mandal, B. (2015) Inhibition of Alzheimer's Amyloid- β Peptide Aggregation and its Disruption by a Conformationally Restricted α/β Hybrid Peptide. *Chem. Commun.* **51**, 2245-2248. (IF-6.222)
33. Thalluri, K., **Paul, A.**, Manne, S. R., Dev, D., and Mandal, B. (2014) Microwave Assisted Chemoselective Organocatalytic Peptide Alcohol Synthesis from C-terminal Amide. *RSC Adv.* **4**, 47841-47847. (IF-3.361)
34. Nadimpally, K. C., **Paul, A.**, and Mandal, B. (2014) Reversal of aggregation using β breaker dipeptide containing peptides: Application to A β ₁₋₄₀ self-assembly and its inhibition. *ACS Chem. Neurosci.* **5**, 400-408. (IF-4.418)
35. Saha, A., Nadimpally, K. C., **Paul, A.**, Kalita, S., and Mandal, B. (2014) Phenolic ester mediated oligopeptide synthesis promoted by HOBt. *Protein Pept. Lett.* **21**, 188-193. (IF-1.890)
36. Nadimpally, K. C., **Paul, A.**, Saha, A., and Mandal, B. (2013) Modulation of Aggregation Propensity of A β ₃₈ by Site Specific Multiple Proline Substitution. *Int. J. Pept. Res. Ther.* **19**, 365-371. (IF-1.931)
37. Thalluri, K., Nadimpally, K. C., Chakravarty, M. P., **Paul, A.**, and Mandal, B. (2013) Ethyl 2-(tert-Butoxycarbonyloxyimino)-2-Cyanoacetate (Boc-Oxyma) as Coupling Reagent for Racemization free Esterification, Thioesterification, Amidation and Peptide Synthesis. *Adv. Synth. Catal.* **355**, 448-462. (IF- 5.837)
38. Thalluri, K., Nadimpally, K. C., **Paul, A.**, and Mandal, B. (2012) Waste reduction in amide synthesis by a continuous method based on recycling of the reaction mixture. *RSC Adv.* **2**, 6838-6845. (IF-3.361)

ORAL/POSTER PRESENTATION IN CONFERENCES

1. **Paul, A.**, and Segal, D. (2019) Mannitol-NQTrp based hybrid conjugates as potent inhibitors of α -Synuclein aggregation in Parkinson's disease. TAU-ESPCI International Summer School on "Self-organization and self-assembly: from Physics and Chemistry to Biology"-September 8 -12, 2019, at Tel Aviv University, Israel. (Poster)
2. **Paul, A.**, Mahapatra, S., Li, Y.M., Gazit, E., and Segal, D. (2019) Novel Small Molecules for Inhibiting the Nano-assemblies of α -Synuclein Amyloids in Parkinson's Disease. AD/PD 2019, The14th International Conference on Alzheimer's and Parkinson' diseases, 26th-31st March 2019, at Lisbon, Portugal. (Poster)
3. **Paul, A.** and Segal, D. (2018) Effect of N-glycosylation on tau protein aggregation in Alzheimer's disease. Sweet Neurodegeneration Workshop 9th-11th July, 2018 at Seminarhaus Grainau, Alspitzstraße 6, 82491 Grainau, Germany organized by Prof Stephan Lichtenthaler research group in German Center for Neurodegenerative Diseases (DZNE), Technical University Munich (TUM), Germany. (Oral)
4. **Paul, A.** and Segal, D. (2018) Disaggregation of tau and PHF6 fibrils by Naphthoquinone-Tryptophan hybrids: Mechanistic insights. UK-Israel Synergy Symposium on Protein misfolding in ageing and neurodegeneration: from basic biology to drug development, 26th-28th March, 2018 at King's College London, London, United Kingdom. (Oral)
5. **Paul, A.** and Mandal, B. (2016) Pro-Drug peptide against Alzheimer's disease: A new approach to disrupt the A β ₁₋₄₀ aggregates into non-toxic species. The 25th ISFN Annual Meeting & the joint Israel-India Neuroscience symposium, 3rd-6th December, 2016 at hotel Hilton Queen of Sheba, Eilat, Israel. (Poster)
6. **Paul, A.** and Mandal, B. (2015) Peptide Based Drug Development Against Alzheimer's Disease. Assam Biotechnology Conclave 20-21st November, 2015, organized by Guwahati Biotech Park, India. (Oral)
7. **Paul, A.**, Mondal, T., and Mandal, B. (2015) Disruption of toxic Alzheimer's amyloid aggregates into non-toxic species by conformationally restricted α/β hybrid peptide. 10th International Symposium on Bio-Organic Chemistry (ISBOC 10), 11th-15th January, 2015, IISER Pune, India with sponsorship of IUPAC, PP 088, page 237. (Poster)
8. **Paul, A.**, Thalluri, K., Manne, S. R., Kalita, S., and Mandal, B. Synthesis of biologically active peptide alcohols from C-terminal amide under microwave irradiation. *Frontier in Chemical Sciences (FICS-2014)*, 4th-6th December, 2014, IIT Guwahati, India, P-24, Page 70. (Poster)
9. **Paul, A.**, Mondal, T., Dev, D., and Mandal, B. Inhibition of Alzheimer's amyloid β derived peptide aggregation by β -sheet breaker hybrid peptide. 8th Mid-Year chemical research society of India (CRSI), National symposium in chemistry. 10th-12th July, 2014, CSIR-NEIST, Jorhat, India. P-88429, page-138. (Poster)
10. **Paul, A.**, Nadimpally, K. C, Thalluri, K., and Mandal, B. One pot protocol for amide synthesis of unprotected amino acids. *National symposium on recent trends in chemical science and technology (RTCST-2012)*, 3rd-4th March, 2012, IIT Patna, P 28, page 80. (Poster)

RESEARCH INTERESTS

- Understanding the mechanism of protein aggregation associated with Neurodegenerative diseases.
- Inhibitor development towards protein misfolding diseases
- Supramolecular Chemistry: protein-protein interaction, protein-lipid interaction and hydrogels.
- Protein/peptide chemistry, solution and solid phase peptide synthesis (SPPS)

SKILLS AND EXPERTISE

- **Laboratory and Instrumentation:** Expertise in Cell culture, Cell viability assay, Western blot, Dot Blot, Sandwich ELISA, Vesicles leakage assay, Synthetic Organic Chemistry, Peptide Synthesis (Solution Phase and Solid Phase), NMR Spectroscopy (1D, 2D), HPLC, LCMS, Mass Spectrometry (ESI, MALDI), Plate reader, UV-Visible spectroscopy, Fluorescence spectroscopy, Circular Dichroism, Isothermal Calorimetry, Dynamic light Scattering, Optical polarizable microscope, Fluorescence microscope, Scanning Electron Microscope and Transmission Electron Microscope *etc.*
- **Software:** Origin, Adobe Illustrator, Adobe Photoshop, MS-Office, Chem Draw, Spin works, SciFinder, and SCOPUS.
- **Teaching Experience:** Worked as Teaching Assistant (TA) in B.Tech and M.Sc Laboratory at IIT Guwahati, India.
- **Language:** English, Bengali, and Hindi.

RESEARCH EXPERIENCES

- I am currently working as a postdoctoral researcher at Seoul National University, South Korea since March 2021. My research goal here in to develop gold nanoparticle-peptide based theranostics towards neurodegenerative diseases. During the past six months, I have been expertise in synthesizing gold nanoparticles of different sizes and shapes, their functionalization with different peptides. I am currently working on the theranostic application of the peptide-attached gold nanoparticle towards the aggregation of A β 42, major culprit in Alzheimer's disease. Prior to that, I have worked as a postdoc researcher at Tel Aviv University, Israel. I have worked with various small molecule-based inhibitors towards amyloid aggregation associated in Parkinson's disease, Alzheimer's disease, Diabetes type-2 and other proteinopathies as main project. In parallel, I have worked with post-translational modification (N-glycosylation) of tau protein and its effect in amyloid formation in Alzheimer's disease. I am also working with supramolecular assembly of short peptide and their application in nanotechnology and biotechnology.
- I was awarded with one-month (Feb-March, 2019) travel fellowship from British Council as a visiting researcher at King's College London. There, I worked with Naphthoquinone-based small molecules as potential inhibitor towards TDP-43 protein aggregation using various biophysical tools including Thioflavin T assay, CD, ITC, NMR and Fluorescence microscopy.
- During my PhD tenure, I mainly worked on the design and synthesis of different peptide-based inhibitors towards Alzheimer's disease and Diabetes type-2. I also worked on the mechanism of amyloid formation at the early stage of protein misfolding. In parallel, I have also worked on synthetic organic chemistry, native chemo selective ligation and development of coupling reagents for peptide synthesis and other organic transformations. We have developed a novel coupling reagent, ethyl 2-(tert-butoxycarbonyloxyimino)-2-cyanoacetate, namely "Boc-Oxyma" for racemization-free esterification, thio-esterification, hydroxamate, amidation and peptide synthesis.
- I am expertise in performing and analyzing various instrumental techniques including, HPLC, LCMS, ESI-MS, UV-Vis, Fluorimeter, CD, FTIR, TEM, SEM, ITC, DLS, Plate reader, Fluorescence and Optical-polarizable microscope, *etc.* I am also expertise in performing various chemical, biological and biophysical methods/techniques, including solution and solid phase peptide synthesis, peptide and protein purification, cell culture, cell viability assay, protein aggregation assay, ELISA, Western blot and Dot blot.

REFERENCES

1. **Prof. Daniel Segal**, Professor, Department of Molecular Microbiology and Biotechnology, Tel Aviv University, Tel Aviv-6997801, Israel. (email: dsegal@post.tau.ac.il; Ph +972-524520149)
2. **Prof. Bhubaneswar Mandal**, Professor, Department of Chemistry, Indian Institute of Technology Guwahati, Guwahati-781039, India. (email: bmandal@iitg.ac.in; Ph +91-9957171511).

I hereby declare that all the information given above is true to the best of my knowledge.

Place: Seoul, South Korea
Date: 14th February 2022

Ashim Paul

(Ashim Paul)