Curriculum Vitae

1 - Academic Qualifications and Experience

Personal Information

First and Family name	Tanmoy Paul	
Researcher code	Inspires	https://inspirehep.net/authors/1771771?ui-citation-summary=true
	Google Scholar	https://scholar.google.com/citations?user=r0p_YJMAAAAJ&hl=en
	Open Researcher and Contributor ID (ORCID)	https://orcid.org/0000-0002-0854-3427
	Research Gate	https://www.researchgate.net/

Current position

Name of Institution	Visva-Bharati University		
Department	Physics		
Address and Country	Santiniketan - 731235, India.		
Phone number	+918617706457	E-mail	paultanmoy720@gmail.com tanmoy.paul@visva-bharati.ac.in
Current position	Assistant Professor		
Key words	Theoretical Physics; cosmology; quantum physics; gravity		

Education

Degree	**Year**	**Institute / University / Board**	**% of marks**
Postdoc	May 2021 – May 2022	International Laboratory for Theoretical Cosmology, TUSUR, Russia.	Host – Prof. Sergei Odintsov
PhD	August 2013 – July 2019 (PhD degree obtained: 31/07/2019) .	Indian Association for the Cultivation of Science	Supervisor – Prof. Soumitra SenGupta
M.Sc in Physics	2011 - 2013	Jadavpur University	74.65 %
B.Sc in Physics	2008 - 2011	Jadavpur University	79.33 %
Higher Secondary	2006 - 2008	W.B.C.H.S.E	89.00 %
Secondary	2006	W.B.B.S.E	90.00 %

Research Interests:

1. High Energy physics, Cosmology, Interplay between Cosmology and Particle Physics, Gravitational Waves.

Honorarium Position: Honorarium Researcher at Laboratoryfor Theoretical Cosmology, International Centre for Gravity and Cosmos, TUSUR, Russia – 634050.

Visiting research Scholar:

Date	**Research institutes**	**Sponsor**	**Position**
24/10/2016 TO 03/11/2016	IIT Guwahati, India.	Prof. Debaprasad Maity	Visiting Scholar and speaker
17/09/2018 TO 17/10/2018	Institut de Ciencies de l'Espai, Spain.	Prof. Sergei D. Odintsov and Prof. Emilio Elizalde	Visiting Scholar and speaker
06/02/2019 TO 10/02/2019	Jamia Milia Islamia, CTP, India.	Prof. Anjan A. Sen.	Visiting Scholar and speaker
20/02/2019 TO 23/02/2019	IMSc, India.	Prof. Kalyana Rama	Visiting Scholar and speaker
01/10/2019 TO 15/10/2019	Institut de Ciencies de l'Espai, Spain.	Prof. Sergei D. Odintsov and Prof. Emilio Elizalde	Visiting Scholar and speaker
16/10/2019 TO 25/10/2019	Universitat Polytecnica de Catalunya, Spain.	Prof. Jaume Haro	Visiting Scholar
25/01/2020 TO 01/02/2020	IIT Guwahati, India.	Prof. Debaprasad Maity	Visiting Scholar and speaker

26/09/2022 TO 28/09/2022	IISER Kolkata, India.	Prof. Narayan Banerjee and Prof. Koushik Dutta	Visiting Scholar and speaker
20/11/2022 TO 28/11/2022	IIT Madras, India.	Prof. L. Sriramkumar	Visiting Scholar and invited lecturer on GR at Mini School on Gravitation and Cosmology

Participation and speaker (or invited speaker) in conference / school.

Date	**Research institutes**	**Sponsor**	**Position**
02/06/2014 TO 28/06/2014	Bits Pilani University, Hyderabad, India.	Serc **School** On Theoretical High Energy Physics.	Participant
13/03/2016 TO 16/03/2016	Indian Association for the Cultivation of Science, India.	Mini **School** on Effective field theory.	Participant
14/03/2017 TO 16/03/2017	Indian Statistical Institute, India.	Physics and Applied Mathematics Researchers Meet **Conference**	Speaker
18/05/2017 TO 20/05/2017	IIT Guwahati, India.	29th IAGRG **Conference**	Speaker
14/03/2018 TO 16/03/2018	Universite Libre de Brussels, Belgium.	String Cosmology Gravity Student Conference (SCGSC) 2018 **Conference**	Speaker
15/03/2019	Jadavpur University, India.	**Seminar** on “Recent Trends In Relativity And Cosmology”	Invited Speaker
06/03/2020	Jadavpur University, India.	**Seminar** on “Gravity, Cosmology & Astrophysics: Recent	Invited Speaker

		Trends In Research”	
09/03/2021 TO 11/03/2021	Bits Pilani University, Hyderabad, India.	Recent Developments in Modified Gravity and Cosmology (**RDCM-2021**)	Invited speaker.
26/10/2021 TO 28/10/2021	Bits Pilani University, Hyderabad, India.	27th International **Conference** of International Academy of Physical Sciences on Advances in Relativity and Cosmology (PARC-2021).	Invited speaker
16/12/2021 TO 19/12/2021	Aristotle University of Thessaloniki, Greece.	**Conference** on “Recent Advances on Theoretical Cosmology and Astrophysics”	Invited speaker
11/03/2022 TO 14/03/2022	IIIT Hyderabad India, University of Lethbridge Canada, IIT Gandhinagar India	Testing Aspects of General Relativity	Invited speaker
19/03/2022 TO 22/03/2022	Department of physics, Soochow University, Taiwan	Asia-Pacific **School and Workshop** on Gravitation and Cosmology 2022	Speaker

Invited speaker:

Date	**Research institutes**	**Sponsor**	**Position**
01/11/2017	IISER Kolkata, India.	Prof. Narayan Banerjee	Invited Speaker
24/02/2019	IIT Madras, India.	Prof. L. Sriramkumar	Invited Speaker
19/09/2020	Central China Normal University, China.	Prof. Taotao Qiu	Invited webinar speaker
29/09/2020	Indian Association for the Cultivation of Science, India.	Dr. Sumanta Chakraborty	Invited webinar speaker

19/10/2020	Saha Institute of Nuclear Physics, India.	Dr. Soumya Chakrabarti	Invited webinar speaker
20/11/2020	Institut de Ciencies de l'Espai (ICE-CSIC), Spain.	Prof. Sergei D. Odintsov	Invited webinar speaker
01/02/2021	Nagoya University, Japan.	Prof. Shinichi Nojiri	Invited webinar speaker
05/03/2021	University of Lethbridge, Canada.	Prof. Saurya Das	Invited webinar speaker
06/04/2021	University of New Brunswick, Canada.	Prof. Edward Wilson Ewing	Invited webinar speaker
01/05/2021	IIT Madras, India.	Prof. Lakshmanan Sriramkumar	Invited webinar speaker
01/10/2021	Institut de Ciencies de l'Espai (ICE-CSIC), Spain.	Prof. Sergei D. Odintsov	Invited webinar speaker
08/12/2021	Indian Statistical Institute (ISI) Kolkata.	Prof. Supratik Pal	Invited Speaker
28/01/2022	University of New Brunswick, Canada.	Prof. Edward Wilson Ewing	Invited webinar speaker
02/05/2022	Nagoya University, Japan	Prof. Shinichi Nojiri	Invited webinar speaker
19/05/2022	S.N. Bose Institute, Kolkata.	Prof. Sunandan Gangopadhyay	Invited Speaker

Youtube link for some presentations:

(1) https://www.youtube.com/watch?v=CDEIcfG65aI

Title – Inflationary magnetogenesis with reheating phase from higher curvature coupling.

Webinar presentation at ICE-CSIC Spain as an invited speaker on 01/10/2021 (mentioned in the above table).

(2) https://www.youtube.com/watch?v=ktLF-VrCsGY&t=2372s

Title – From a bounce to the dark energy era.

Webinar presentation at ICE-CSIC Spain as an invited speaker on 20/11/2020 (mentioned in the above table).

Collaborations:

(1) International Collaborators: Sergei D. Odintsov from ICE-CSIC, Emilio Elizalde from ICE-CSIC Spain, Shinichi Nojiri from Nagoya U. Japan, Diego Saez Chillon Gomez from Basque U. Spain, Kazuharu Bamba from Fukushima U. Japan, Vasilis K. Oikonomou from Tomsk Institute Russia, Iver H. Brevik from Norwegian University of Science and Technology (NTNU) Norway.

(2) National Collaborators: Soumitra SenGupta from IACS India, Narayan Banerjee from IISER India, Debaprasad Maity from IIT Guwahati India, Lakshmanan Sriramkumar from IIT Madras india, Riazul Haque from IIT Guwahati India, Ashmita Das from IIT Madras India, Sumanta Chakraborty from IACS India, Joydip Mitra from Scotish Churge College India, Indrani Banerjee from NIT Rourkela India.

As reviewer : In the Journal : (1) Classical and Qauntum Gravity (CQG), (2) Nuclear Physics B (NPB), (3) European Physical Journal A (EPJA), (4) European Physical Journal C (EPJC), (5) General Relativity and Gravitation (GERG), (6) Physics of the Dark Universe (PDU), (7) Physica Scripta, (8) Physics Reports, (9) Universe (MDPI).

2 - Details of journal papers, listed in chronological order: Tanmoy Paul maintains a constant publication rate with an average citation = 19 and h-Index = 19. The journal publications are given below (**an (*) with the corresponding author**) :

No.	Authors	Title of the paper	Journal. Journal Ref. and DOI
1.	S. Kibaroglu(*), SD Odintsov, T Paul	Cosmology of unimoduludr Born-Infeld-F(R) gravity	Physics of the Dark Universe. REF: Phys.Dark Univ. 44 (2024) 101445
2.	SD Odintsov, SD Onofrio, T Paul(*)	Entropic inflation in presence of scalar field	Universe (Invited article). REF: *Universe* 10 (2024) 1, 4
3.	S Nojiri, SD Odintsov, T Paul(*)	Microscopic Interpretation of generalized entropy	Physics Letters B (PLB) REF: *Phys.Lett.B* 847 (2023) 138321
4.	S Nojiri, SD Odintsov, T Paul(*)	Horizon entropy consistent with the FLRW equations for general modified theories of gravity and for all equations of state of the matter field	Physical Review D (PRD) REF: Phys.Rev.D 109 (2024) 4, 043532
5.	SD Odintsov, S Onofrio and T Paul(*)	Holographic relaization from inflation to reheating in generalized entropic cosmology	Physics of the Dark Universe. DOI: https://doi.org/10.1016/j.dark.2023.101277
6.	SD Odintsov and T Paul(*)	From inflation to reheating and their dynamical stability analysis in Gauss-Bonnet gravity	Physics of the Dark Universe. REF: Phys.Dark Univ. 42, (2023) 101263
7.	T Paul(*) and S SenGupta	Ekpyrotic bounce driven by Kalb-Ramond field	Physics of the Dark Universe. REF: Phys.Dark Univ. 41, (2023) 101236.
8.	S Nojiri, SD Odintsov and T Paul(*)	Holographic realization of constant roll inflation and dark energy: An unified scenario	Physics Letters B. REF: Phys.Lett.B 841 (2023) 1379 26
9.	SD Odintsov and T Paul(*)	A non-singular generalized entropy and its impliations on bounce cosmology	Physics of the Dark Universe. REF: Phys.Dark Univ. 39 (2023) 101159

			DOI:10.1016/j.dark.2022.101159
10.	S Nojiri, SD Odintsov and T Paul(*)	Modified Cosmology from the thermodynamics of apparent horizon	Physics Letters B REF: Phys.Lett.B 835 (2022) 137553 DOI: 10.1016/j.physletb.2022.137553
11.	T Paul(*)	Viable Requirements of Curvature Coupling Helical Magnetogenesis Scenario	Symmetry (MDPI) REF: Symmetry 14 (2022) 6, 1086 DOI: 10.3390/sym14061086
12.	S Nojiri, SD Odintsov and T Paul(*)	Early and late universe holographic cosmology from a new generalized entropy	Physics Letters B REF: Phys.Lett.B 831 (2022) 137189 DOI: 10.1016/j.physletb.2022.137189
13.	I Banerjee, T Paul and S SenGupta(*) (review article)	Aspects of non-singular bounce in modified gravity theories	General Relativity and Gravitation REF: Gen.Rel.Grav. 54 (2022) 10, 119 DOI: 10.1007/s10714-022-02988-3
14.	SD Odintsov and T Paul(*)	Bounce universe with finite time singularity	Universe (MDPI) REF: Universe 8 (2022) 5, 292 DOI: 10.3390/universe8050292
15.	S Nojiri, SD Odintsov and T Paul(*)	Towards a smooth unification from an ekpyrotic bounce to the dark energy era	Physics of the Dark Universe. REF: Phys.Dark Univ. 35 (2022) 100984 DOI:10.1016/j.dark.2022.100984
16.	S Nojiri, SD Odintsov and T Paul(*)	Barrow entropic dark energy: A member of generalized holographic dark energy family	Physics Letters B. REF: Phys.Lett.B 825 (2022) 136844. DOI: 10.1016/j.physletb.2021.136844

17.	K Bamba, SD Odintsov, T Paul(*) and D Maity	Helical magnetogenesis with reheating phase from higher curvature coupling and baryogenesis	Physics of the Dark Universe REF: Phys.Dark Univ. 36 (2022) 101025 DOI: 10.1016/j.dark.2022.101025
18.	SD Odintsov, T Paul(*), I Banerjee, R Myrzakulov and S SenGupta	Unifying an asymmetric bounce to the dark energy in Chern–Simons F(R) gravity	Physics of the Dark Universe. REF: Phys.Dark Univ. 33 (2021) 100864. DOI: 10.1016/j.dark.2021.100864
19.	R Haque(*), D Maity, T Paul and L Sriramkumar	Decoding the phases of early and late time reheating through imprints on primordial gravitational waves	Physical Review D. REF: Phys.Rev.D 104 (2021) 6, 063513. DOI: 10.1103/PhysRevD.104.063513
20.	I Banerjee, T Paul(*) and S SenGupta	Critical analysis of modulus stabilization in a higher dimensional F(R) gravity	Physical Review D. REF: Phys.Rev.D 104 (2021) 10, 104018 DOI:10.1103/PhysRevD.104.104018
21.	S Nojiri, SD Odintsov and T Paul(*)	Different Faces of Generalized Holographic Dark Energy	Symmetry (MDPI). REF: Symmetry 13 (2021) 6, 928 Doi:10.3390/sym13060928
22.	D Maity, T Paul(*) and S Pal	Effective theory of inflationary magnetogenesis and constraints on reheating	Journal of Cosmology and Astroparticle Physics. REF: JCAP 05 (2021) 045. DOI:10.1088/1475-7516/2021/05/045
23.	K Bamba, E Elizalde, SD Odintsov and T Paul(*)	Inflationary magnetogenesis with reheating phase from higher curvature coupling.	Journal of Cosmology and Astroparticle Physics. REF: JCAP 04 (2021) 009 DOI:10.1088/1475-7516/2021/04/009
24.	I Banerjee, T Paul(*) and S SenGupta	Bouncing Cosmology in a curved braneworld.	Journal of Cosmology and Astroparticle Physics.

			REF: JCAP 02 (2021) 041 DOI: 10.1088/1475-7516/2021/02/041
25.	SD Odintsov, V Oikonomou, T Paul(*)	From a bounce to the dark energy era with F(R) gravity.	Classical and Quantum Gravity. REF: Class.Quant.Grav. 37 (2020) 23, 235005 DOI: 10.1088/1361-6382/abbc47
26.	T Paul(*) and S SenGupta.	Scalaron tunneling and the fate of antisymmetric tensor fields in F(R) gravity.	Classical and Quantum Gravity. REF: Class.Quant.Grav. 37 (2020) 22, 225012 DOI: 10.1088/1361-6382/abb926
27.	T Paul(*) (invited review article)	Antisymmetric tensor fields in modified gravity: a summary	Symmetry (MDPI). REF: Symmetry 12 (2020) 9, 1573 DOI: 10.3390/sym12091573
28.	SD Odintsov, V Oikonomou, T Paul(*)	Bottom-up reconstruction of non-singular bounce in F(R) gravity from observational indices	Nuclear Physics B. REF: Nuclear Physics B 959 (2020) 115159 DOI: 10.1016/j.nuclphysb.2020.115159
29.	S Nojiri, SD Odintsov, V Oikonomou, T Paul(*)	Unifying Holographic Inflation with Holographic Dark Energy: a Covariant Approach	Physical Review D. REF: Phys.Rev.D 102 (2020) 2, 023540 DOI: 10.1103/PhysRevD.102.023540
30.	T Paul(*), N Banerjee	Cosmological quantum entanglement: A possible testbed for the existence of Kalb-Ramond field.	Classical and Quantum Gravity. REF: Class.Quant.Grav 37 (2020) 13, 135013 DOI: 10.1088/1361-6382/ab8bb9
31.	E Elizalde, SD Odintsov, V Oikonomou(*), T Paul	Extended matter bounce scenario in ghost free f(R, G) gravity compatible with GW170817	Nuclear Physics B. REF: Nuclear Physics B 954(2020) 114984 DOI: 10.1016/j.nuclphysb.2020.114984

32.	E Elizalde, SD Odintsov, T Paul(*)	Viable non-singular cosmic bounce in holonomy improved F(R) gravity endowed with a Lagrange multiplier	The European Physical Journal C. REF: Eur.Phys.J.C 80 (2020) 1, 10 DOI: 10.1140/epjc/s10052-019-7544-3
33.	S Nojiri, SD Odintsov, T Paul(*)	Non-singular Bounce Cosmology from Lagrange Multiplier F(R) Gravity	Physical Review D. REF: Phys.Rev.D 100 (2019) 8, 084056 DOI: 10.1103/PhysRevD.100.084056
34.	T Paul(*)	Holographic correspondence of F(R) gravity with/without matter fields	EPL (Europhysics Letters). EPL 127 (2019) 2, 20004 DOI: 10.1209/0295-5075/127/20004
35.	N Banerjee, T Paul(*)	Electromagnetic effect on anisotropic scalar field collapse in higher curvature gravity	General Relativity and Gravitation. REF: Gen.Rel.Grav. 51 (2019) 7, 91 DOI: 10.1007/s10714-019-2574-6
36.	T Paul(*), S SenGupta	Dynamical suppression of spacetime torsion	The European Physical Journal C. REF: Eur.Phys.J.C 79 (2019) 7, 591 DOI: 10.1140/epjc/s10052-019-7109-5
37.	S Nojiri, SD Odintsov, V Oikonomou(*), T Paul	Viable inflationary models in a ghost-free Gauss–Bonnet theory of gravity	The European Physical Journal C. REF: Eur.Phys.J.C 79 (2019) 7, 565 DOI: 10.1140/epjc/s10052-019-7080-1
38.	E Elizalde, SD Odintsov, T Paul, DS Chillon Gomez(*)	Inflationary universe in F(R) gravity with antisymmetric tensor fields and their suppression during its evolution	Physical Review D. REF: Phys.Rev.D 99 (2019) 6, 063506 DOI: 10.1103/PhysRevD.99.063506
39.	E Elizalde, SD Odintsov, V Oikonomou(*), T Paul	Logarithmic-corrected R2 gravity inflation in the presence of Kalb-Ramond fields	Journal of Cosmology and Astroparticle Physics. REF: JCAP 02 (2019) 017 DOI:10.1088/1475-7516/2019/02/017

40.	A Das, T Paul(*), S SenGupta	Invisibility of antisymmetric tensor fields in the light of F(R) gravity	Physical Review D. REF: Phys.Rev.D 98 (2018) 10, 104002 DOI: 10.1103/PhysRevD.98.104002
41.	S Chakraborty, T Paul(*) , S SenGupta	Inflation driven by Einstein-Gauss-Bonnet gravity	Physical Review D. REF: Phys.Rev.D 98 (2018) 8, 083539 DOI: 10.1103/PhysRevD.98.083539
42.	T Paul(*)	A possible testbed for warped extra dimension from the angle of Buchdahl's limit	The European Physical Journal C. REF: Eur.Phys.J.C 78 (2018) 6, 508 DOI: 10.1140/epjc/s10052-018-5990-y
43.	T Paul(*) , S SenGupta	Radion tunneling in modified theories of gravity	The European Physical Journal C. REF: Eur.Phys.J.C 78 (2018) 4, 338 DOI: 10.1140/epjc/s10052-018-5824-y
44.	N Banerjee, T Paul(*)	Scalar field collapse in Gauss–Bonnet gravity	The European Physical Journal C. REF: Eur.Phys.J.C 78 (2018) 2, 130 DOI: 10.1140/epjc/s10052-018-5615-5
45.	A Das, H Mukherjee, T Paul(*), S SenGupta	Radion stabilization in higher curvature warped spacetime	The European Physical Journal C. REF: Eur.Phys.J.C 78 (2018) 2, 108 DOI: 10.1140/epjc/s10052-018-5603-9
46.	J Mitra, T Paul(*), S SenGupta	Fermion localization in higher curvature and scalar–tensor theories of gravity	The European Physical Journal C. REF: Eur.Phys.J.C 77 (2017) 12, 833 DOI: 10.1140/epjc/s10052-017-5420-6
47.	A Das, D Maity, T Paul(*), S SenGupta	Bouncing cosmology from warped extra dimensional scenario	The European Physical Journal C. REF: Eur.Phys.J.C 77 (2017) 12, 813

			DOI: 10.1140/epjc/s10052-017-5396-2
48.	N Banerjee, T Paul[(*)]	Inflationary scenario from higher curvature warped spacetime	The European Physical Journal C. REF: Eur.Phys.J.C 77 (2017) 10, 672 DOI: 10.1140/epjc/s10052-017-5256-0
49.	T Paul[(*)] , S SenGupta	Fermion localization in a backreacted warped spacetime	Physical Review D. REF: Phys.Rev.D 95 (2017) 11, 115011 DOI: 10.1103/PhysRevD.95.115011
50.	T Paul[(*)] , S SenGupta	Graviton Kaluza-Klein modes in nonflat branes with stabilized modulus	Physical Review D. REF: Phys.Rev.D 93 (2016) 8, 085035 DOI: 10.1103/PhysRevD.93.08503

3 - Awards, Fellowships and Patents:

3.1 – Award, Fellowships and Distinctions :

(1) Symmetry Young Investigator Award from Symmetry (MDPI) in 2021.

(2) Juan de la Cierva Fellow from Spain Ministry of Science, Innovations and Universities (MICINN) in 2022.

(3) Postdoctoral Researcher Fellowship from International Laboratory for Theoretical Cosmololgy TUSUR Russia, in 2021.

(4) Honorarium Researcher at High Energy Physics group of TUSUR Russia, in 2023.

(5) International Program Exchange Fellowship (IPEF) from Institute of Astrophysics (IoA) Central China Normal University (CCNU), in April 2020.

(6) Institute Fellowship from Indian Association for the Cultivation of Science India, in August 2013.

(7) "JEST" Fellowship, conducted by S. N. Bose National Centre for Basic Sciences, in 2013 July. All India rank = 07.

(8) "GATE" Fellowship, conducted by Indian Institute of Technology (IITs) India, in 2013 July. All India Rank = 06.

(9) "CSIR" Fellowship, from Council of Scientific and Industrial Research (CSIR) - UGC India, in 2013. All India rank = 30.

(10) "JAM" Fellowship, conducted by Indian Institute of Technology (IITs) India, in 2011 August. All India Rank = 10.

(11) "INSPIRE" Fellowship, from Department of Science and Technology (DST) India, in 2008 October.

3.2 – Patents: Not Relevant (My research works are highly theoretical, so there is no opportunity to apply for Patents)

4 - Research guidance (Ph.D./M.S. only with formal guide/co-guide status) listing:

(1) Tanmoy Paul (T Paul, the candidate) supervised **4 Master projects at NIT Jamshedpur** as a sole-guide on cosmology and astrophysics. In particular, the project is based on equivalence between Jordan and Einstein frames in cosmology sector.

(1) Tanmoy Paul (T Paul, the candidate) supervised **Shabnam Hoque** (now she is in Berlin University) for her GRE project as a sole-guide, in the year 2018. **The project is titled - "Possible effects of extra dimension on Buchdahl's limit of a compact star".** In particular, it is based on how the presence of extra dimension affects the mass-radius ratio of a stable compact star. As a result, T Paul and S Hoque found that in presence of extra dimension, the Buchdahl limit of a compact star goes beyond than the value 8/9 and can reach up to unity, while the prediction from General Relativity is 8/9. Therefore, if the mass-radius ratio of a star is found to lie within [8/9,1], then it may provide a possible testbed for extra dimension.

(2) Two students (**Sayari Majumdar from Jadavpur University and Ardhendu Paul from Calcutta University**) did their MSc project with T Paul's sole-mentorship, in **2020-21**. Now Sayari and Ardhendu are doing PhD from RRI and SN Bose respectively. **The project is titled - "Possible effects of background spacetime on particle's stability".** In particular, it is based on how quantum tunneling of a free particle is affected by spacetime structure. The manuscript is under review in an international journal. As a result, T Paul and his students found that if quantum fluctuations of a test particle (propagating on a curved spacetime) are taken into account, then the background spacetime indeed affects the stability of the test particle. In comparison of Schwarzschild and Reissner-Nordstrom spacetime, the results clearly argue that the Reissner Nordstrom spacetime makes a particle more stable in comparison to the Schwarzschild spacetime, Here it may be mentioned that the spacetime is considered to be classical, however the particle is quantum nature.

(3) T Paul supervised **Souvik Ghosh** (**from IISER TVM**) for his MSc project as a sole-guide, in the **year 2021**. **The project is titled – "Mercury perihelion from Special Realtivistic corrections of Kepler's law".** In particular, we tried to address how far we can go to observation, regarding the Mercury perihelion, considering only the Special Relativistic corrections on Kepler's laws.

(5) Currently, T Paul is supervising **1 PhD student (Dibakar Naik from NIT Jamshedpur)** as a co-guide on cosmology; and **6 Masters students (from Visva-harati University, NIT Jamshedpur and Burdwan University)**.

5 - Role in and details of Sponsored Research & Consulting projects carried out, listing:

(1) **Name of the project**: Probing the physics of the early universe through primary and secondary gravitational waves.

Status : In Progress.

Project Code – TAR/2021/000180. **Entity where the project takes place**: Chandernagore College and IIT Madras.

Principal Investigator : Tanmoy Paul (the candidate) , Asst. Professor at Chandannagar Govt. College, India.

Financing source: SERB, India. **Approved** – 02/12/2021. **Duration** – 3 years. **Total amount**: Rs. 15 Lacs
Brief description: Tanmoy Paul (the candidate) is the Principal Investigator of this project which has been approved on 2nd December, 2021 by SERB, India. Lakshmanan Sriramkumar (Professor of IIT Madras) acts as the mentor or Co-PI of this project. The works under this project are not started yet (as it has been approved less than 2 month ago). However Tanmoy Paul and Lakshmanan Sriramkumar planned some interesting works on primordial GWs and primordial magnetic fields, which will be fulfilled under this project. In particular, the project is titled- 'Probing the physics of the early universe through primary and secondary gravitational waves'. Primordial gravitational waves (PGWs) carry the imprints of the dynamics of the universe during its earliest stages. With a variety of GW detectors being proposed to operate over a wide range of frequencies, there is great expectation that observations of primordial GWs can provide us with an unprecedented window to the physics operating during inflation (or bounce) and reheating. The projects we have planned are mainly directed to understand the early universe, in particular, inflation / bounce and the mechanism of reheating epoch through the spectrum of PGWs observed today. Our proposal contains projects like – exploring the evolution of the reheating equation of state parameter by the PGWs spectrum, studying the PGWs evolution in a singularity free universe and investigate their consistency with the recent NANOGrav observatory, narrowing the range of viability of modified theories of gravity through their signatures at low scales (other than the CMB scale) particularly from PGWs observation, mechanism of primordial black holes (PBHs) in non-singular universe etc. With the recent and future missions like advanced LIGO (the sensitivity lies within $10 – 10^3$ Hz.), ET ($1–10^4$ Hz), DECIGO (10^{-3}–1 Hz), eLISA (10^{-5} – 1 Hz) ; this is an exciting time to explore the above mentioned issues and corroborate the results with the data.

(2) **Name of the project**: Models for the accelerated expansion of the Universe, quantum fluctuations and zeta regularization.

Status: Completed

Project Code – FIS2016-76363-P. **Entity where the project took place**: ICE-CSIC, Spain.

Principal Investigator: Sergei Odintsov , Professor in ICE-CSIC, Spain.

Participation of Tanmoy Paul (the candidate): Researcher.

Financing source: MICINN. **Start-End date**: 01/01/2017-31/12/2019. **Total amount**: 99.000 €.

Some articles of Tanmoy Paul (the candidate) under this project and a brief description – Tanmoy Paul participates as an active researcher in this project. Some of the articles under this project are – Class.Quant.Grav. 37 (2020) 23, 235005 ; Phys.Rev.D 99 (2019) 6, 063506 ; JCAP 02 (2019) 017. These papers are based on the collaboration with Prof. Sergei Odintsov (PI of the project), Prof. Emilio Elizalde. In all of these papers, Tanmoy Paul's contribution are as follows: full idea of the work (in most cases); all analytic and numerical calculations (numerical calculations were performed in Mathematica); initial write-up and revision of the manuscript; corresponding author (some cases). Based on these works, we proposed a possible explanation of the question: why the present universe is free from any noticeable footmarks of higher rank Kalb-Ramond (KR) field, despite having the signatures of scalar, vector, fermion as well as of gravity? The higher curvature warped braneworld scenario may serve a better explanation about why the present universe carries no observable signatures of KR field.

(3) **Name of the project**: Search For Signatures Of Gravity Theories Beyond Einstein.

Status: Completed

Project Code – EMR/2017/001372. **Entity where the project took place**: IACS, India.

Principal Investigator : Soumitra SenGupta , Professor in IACS, India.

Participation of Tanmoy Paul (the candidate): Researcher.

Financing source: SERB, India. **Start-End date**: 21/03/2018 - 28/03/2021. **Total amount**: Rs.1906243.

Some articles of Tanmoy Paul (the candidate) under this project and a brief description – Tanmoy Paul participates as an active researcher in this project. Some of the articles under this project are - Class.Quant.Grav. 37 (2020) 22, 225012 ; Phys.Rev.D 98 (2018) 10, 104002 ; Phys.Rev.D 98 (2018) 8, 083539 etc. These papers are based on the collaboration with Prof. Soumitra SenGupta (PI of the project). In all of these papers, Tanmoy Paul's contribution are as follows: partial (or full) idea of the work ; analytic and numerical calculations (numerical calculations were performed in Mathematica) ; initial write-up (revision in some cases) of the manuscript ; corresponding author. Based on these works, we proposed a viable inflationary scenario with a graceful exit mechanism in Einstein-Gauss-Bonnet gravity theory. We showed that the Gauss-Bonnet theory without any scalar potential is not consistent with slow roll inflationary condition. This argues the importance of the scalar potential in Gauss-Bonnet inflation. Actually when the scalar field achieves a stable value, the Gauss-Bonnet term becomes topological invariant and the inflation gets an end.

6 – Seminar / Conference organization:

1. 7th Topical conference on gravity, cosmology and astrophysics (eastern region) 2017 (TCGCA-ER7)
Date- 25/03/2017. My Position – Co-Convener.

2. One day Seminar on “Wonders of the Quantum World” at Chandannagar govt. College.
Date – 17/08/2020. Speaker – Soumitra SenGupta (Professor at IACS, Kolkata).
My Position – Convener.

3. One day webinar on “Title – Dark Universe by Telescopes” at Chandannagar Govt. College.
Date – 27/01/2022. Speaker – Supratik Pal (Profesosor at Indian Statistical Institute, Kolkata).
My Position – Convener.

7 - Referees:

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