

# Dr. Prashanth Jaikumar

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## Academic Profile

**Fields of Research** *Astrophysics: Gravitational Waves, Neutron Star Phenomena, Nucleosynthesis, Exoplanets*

### *Administrative Appointments*

Aug. 2022 - present *Department Chair, Physics & Astronomy, California State University Long Beach, California, USA*

### *Faculty Appointments*

Aug. 2019 - present *Professor, California State University Long Beach, California, USA*

Aug. 2014 - 19 *Associate Professor, California State University Long Beach, California, USA*

Aug. 2009 - 14 *Assistant Professor, California State University Long Beach, California, USA*

July 2007 - Aug 2009 *Fellow, Institute of Mathematical Sciences, Chennai, India*

May 2008 - Nov 2008 *Visiting Scholar, Argonne National Laboratory, Argonne, Illinois, USA*

### *Postdoctoral Appointments*

Sep 2006 - June 2007 *Ohio University (Mentor: Madappa Prakash)*

Sep 2004 - Aug 2006 *Argonne National Laboratory (Mentor: Craig Roberts)*

Sep 2002 - Aug 2004 *McGill University (Mentor: Charles Gale)*

### *Ph.D., Physics*

Aug 1997 - Aug 2002 *Stony Brook University (Thesis Title: Electroweak Probes of Dense Quark Matter)*

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## Research Grants & Awards

July 2019 - July 2022 *PI, Single Investigator Award, National Science Foundation (\$250K)*

March 2017 *Distinguished Faculty Scholarly and Creative Achievement Award - CSULB (\$2000)*

July 2016 - June 2019 *PI, Single Investigator Award, National Science Foundation (\$180K)*

June 2012 - June 2016 *PI, Cottrell Scholar Award, Research Corporation for Science Advancement (\$45K)*

May 2010-May 2012 *PI, NASA Graduate Research Fellowship (\$60K)*

May 2010-Dec 2011 *Co-PI, U.S. Army High Performance Computing Research Grant (\$257K)*

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## Overview of Publication Record (from Google Scholar)

2001-present *95 publications (53 with CSULB by-line): 54 regular, 11 conference proceedings, 15 bulletins/abstracts, 1 invited review, 14 MS thesis*

*Astrophys.J(10), Phys.Rev.D(12), Phys.Rev.C(10), Phys.Rev.Lett.(3), JHEP(1), Phys.Lett.B(3), Nuc.Phys.B(1), Mod.Phys.Lett.A(1), Astron.&Astrophys.(6), Few-Body Sys.(1), Adv. High Energy Physics (1), Rev. Mex. AA(1), Astrophys. & Space Science (1), Int.J.Mod.Phys.A(2), Pramana(3), Eur.Phys.J.C(1), e-Conf(2), Universe (4), Galaxies (1), Fundamental Constants & Dark Energy (1), Bulletin of the American Physical Society (11), American Physical Society Meeting Abstracts (4), American Astronomical Society Abstract (1), MS Thesis on Proquest Database (14)*

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## Overview of Research Talks

2001-present *63 talks (34 as CSULB faculty member)*

*International Conferences (11), National Conferences (6), Department Colloquia (16), Research Seminars (15), Invited talk at National Laboratories (6), Workshop presentations (5), Public Outreach (4)*

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## Organizational Activities

- 2019 *International Steering Committee - CSQCD VIII Conference, Bangalore, India*
- 2018 *International Steering Committee - CSQCD VII Conference, New York, USA*
- 2017 *International Steering Committee - CSQCD VI Conference, Dubna, Russia*
- 2016 *Scientific Organizing Committee - CSQCD V Conference, Gran Sasso, Italy*
- 2014 -18, Fall 2013 *Organizer - Colloquia Series, Dept. of Physics & Astronomy, CSU Long Beach*
- 2014-15 *Organizer - Physics GRE Bootcamp for Southern California*
- Dec 2012 *Scientific committee member - Compact stars in the QCD Phase Diagram III, Guarujá, Brazil*
- May 2010 *Scientific committee member - Compact stars in the QCD Phase Diagram II, Beijing, China*
- April 2009 *Convenor - Neutrinos in Particle Astrophysics and Cosmology (NuPAC), Chennai, India*
- Jan 2008 *Organizing Committee - X<sup>th</sup> Workshop on High-energy Physics Phenomenology, Chennai, India*
- 2005/06 *Theory Seminar Co-ordinator, Physics Division, Argonne National Laboratory*
- 2003/04 *Theory Seminar Co-ordinator, Physics Department, McGill University*

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## Professional Commitments & Service

- 2019-present *Steering Committee Member, Cal-Bridge (CSU-UC Partnership for Astronomy PhD programs)*
- 2017-2021 *Member, College Council (College of Natural Science & Mathematics, CSU Long Beach)*
- 2017-present *Member, Academic Integrity Committee (CSU Long Beach)*
- 2017-present *Member, Professional Responsibility Committee (CSU Long Beach)*
- 2015-2017 *Member, Faculty Committee on Technology (CSU Long Beach)*
- 2015-present *Associate Member, GWPAC (Gravitational Wave Physics & Astrophysics Center)*
- July 2014-present *Liaison, Cal-Bridge (CSU-UC Partnership for Astronomy PhD programs)*
- May 2013-present *Liaison, CAMPARE (California-Arizona Minority Participation in Astronomy Research)*
- Spring 2012-2016 *Liaison, NASA-JPL student internships*
- Aug 2010-present *Library representative, Dept. of Physics & Astronomy, CSU Long Beach*
- 2002-present *Referee, Physical Review Journals, Nuclear Physics Journals, MDPI Journals, Astrophysics Journals*
- 2010-present *Panel Referee, National Science Foundation*
- 2006-present *Member, American Physical Society*

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## Masters Theses Supervised

- Aug 2009 - present *14 M.S. theses supervised, all students graduated, 4 more in progress*
- exp.2023 *Raymond Ly - Data analysis and modeling of gravitational wave signals from LIGO/VIRGO*
- exp.2023 *Tomas Virgen - g-modes in the relativistic cowling approximation*
- exp.2023 *Vinh Tran - Sound speeds and g-modes in hyperonic matter*
- 2022 *Nick Lozano - Finite temperature effects on g-modes of neutron stars*
- 2021 *Christopher Garnier - Modeling axion-graviton interactions using an effective approach*
- 2019 *Nina Miller - Radius Inflation from Deuterium Fusion in the core of Hot Jupiters*
- 2019 *Benjamin Diaz - Enthalpy Method for Solving Neutron Star Structure*
- 2019 *Michael Lanoye - Computing Gravitational Wave Frequencies of Neutron Stars*
- 2018 *Raphael Monroy - The Effects of Superfluidity on the Oscillation Modes of Neutron Stars*
- 2017 *Zack Hall - General Relativistic Non-radial Oscillations of Compact Stars*
- 2016 *Jessica Asbell - Non-radial Fluid Pulsation Modes of Compact Stars*
- 2014 *Anashe Bandari - Calculation of the Non-Radial Oscillation in Neutron Stars*
- 2014 *Joshua Arenson - Studies of r-process Nucleosynthesis using r-Java, a GUI-based code*
- 2014 *Mark Lohmann - Neutral weak nucleon Form Factors from the AdS/QCD correspondence*
- 2013 *Richard Patrick - The search for Supersymmetry in Particle Physics*
- 2012 *Stou Sandalski - Neptune: An astrophysical SPH code for massively parallel computer architectures*
- 2012 *Sam Koshy - Non-radial Fluid Pulsation Modes of Compact Stars*

## List of Publications

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### Regular Journal Articles 54 - (#1-31 have CSULB by-line) - Student Names Underlined

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1. “Temperature effects on core g-modes of neutron stars”

N. Lozano, V. Tran, P. Jaikumar, *Galaxies* 10 (4), 79 (2022).

We showed that g-mode oscillations of canonical mass neutron stars are suppressed at high temperature.

2. “General relativistic treatment of f-mode oscillations of hyperonic stars”

B. K. Pradhan, D. Chatterjee, M. Lanoye, P. Jaikumar, *Phys. Rev. C*, accepted for publication (2022).

We derived scaling relations for hyperonic stars in the context of f-mode oscillations in general relativity.

3. “Quasi-normal g-modes of neutron stars with quarks”

T Zhao, C Constantinou, P Jaikumar, M Prakash, *Phys. Rev. D*, accepted for publication (2022).

We derived the g-mode oscillation spectrum of neutron/hybrid stars in full general relativity.

4. “Thermal relaxation and cooling of quark stars with a strangelet crust”

J Zapata, R Negreiros, T Sales, P Jaikumar, *Astron. & Astrophys.*, accepted for publication (2022).

We showed that a strangelet crust on a compact star leads to faster initial cooling.

5. “g-modes of neutron stars with hadron-to-quark crossover transitions”

C Constantinou, S Han, P Jaikumar, M Prakash, *Phys. Rev. D* 104 (12), 123032 (2022).

We showed that a Gibbs model for the quark-hadron phase leads to enhanced g-mode frequencies in hybrid stars.

6. “g-mode oscillations in hybrid stars: A tale of two sounds”

P Jaikumar, A Semposki, M Prakash, C Constantinou, *Phys. Rev. D* 103, 123009 (2021).

We derived general expressions for sound speeds in dense matter in the context of g-mode oscillations.

7. “Lifting the Veil on Quark Matter in Compact Stars with Core g-mode Oscillations ”

W. Wei, M. Salinas, T. Klähn, P. Jaikumar, M. Barry, *The Astrophysical Journal* 904 (2), 187 (2020)

We showed that g-mode oscillations can uncover the presence of quark matter in neutron stars.

8. “Strange Stars in the Vector Interaction Enhanced Bag Model”

M. Salinas, T. Klähn, & P. Jaikumar, *Particles* 2 (4), 447-456 (2019)

We explored the stability criterion for strange quark stars in the vector interaction enhanced Bag model of quark matter.

9. “Identifying Quark Matter in Hybrid Stars through Relativistic Tidal Deformations”

W. Wei, B. Irving, M. Salinas, T. Klähn, & P. Jaikumar, *Universe* 5 (9), 193 (2019)

We set constraints on the parameters of the equation of state for a mixed phase of quarks and hadrons using tidal polarizability data on the gravitational wave/neutron star merger event GW170817.

10. “Camouflage of the phase transition to quark matter in neutron stars”

B Irving, T. Klähn, P. Jaikumar, M Salinas, & W Wei , *The Astrophysical Journal* 887 (2), 151 (2019)

We critically examined the impact of continuous phase transitions on mass-radius relations of neutron stars.

11. “Non-Radial Oscillation Modes of Superfluid Neutron Stars Modeled with CompOSE”

P. Jaikumar, T. Klähn, & R. Monroy, *Universe* 4, no.3, 53 (2018)

We computed the fundamental oscillation modes of a coupled neutron-proton superfluid for a variety of stellar models

12. “Interface effects of strange quark matter with density dependent quark masses”

C.-J. Xia, G.-X. Peng, T.-T. Sun, W.-L. Guo, D.-H. Lu, & P. Jaikumar, *Physical Review D* 98 (3), 034031 (2018)

We studied the effect of surface tension on strangelets using a quasiparticle model and compared to other model estimates.

13. “Numerical Simulation of the Hydrodynamical Combustion to Strange Quark Matter in the Trapped Neutrino Regime”  
A. Ouyed, R. Ouyed, & P. Jaikumar, *Physics Letters B* 777 184 (2018)  
We performed numerical studies of the effect of neutrino trapping on the quark-hadron combustion front in neutron stars.
14. “Nonradial oscillation modes of compact stars with a crust”  
C. Vasquez, Z. Hall & P. Jaikumar, *Physical Review C* 96 no.6, 065803 (2017)  
Computation of the spectrum of non-radial modes for compact stars with a crust made of quarks or nuclei.
15. “Effect of strong magnetic field on competing order parameters in two-flavor dense quark matter”  
T. Mandal & P. Jaikumar; *Adv.High Energy Phys.* 2017 (2017)  
Investigation of strong magnetic field effects on competing order parameters in quark matter at high density.
16. “Effect of temperature and magnetic field on two-flavor superconducting quark matter”  
T. Mandal & P. Jaikumar; *Physical Review D* 94 (7), 074016 (2016)  
Systematic study of finite temperature on the phases of magnetized two-flavor quark matter at high density.
17. “Nuclear Fusion in the Deuterated cores of inflated hot Jupiters”  
R. Ouyed & P. Jaikumar; *Astrophysics & Space Science* 361 (3), 1 (2016)  
Explores the novel idea of Deuterium fusion as the mechanism of radius inflation of hot Jupiters.
18. “r-Java 2.0: The astrophysics”  
M. Kostka, N. Koning, Z. Shand, R. Ouyed & P. Jaikumar; accepted for publication in *Astronomy & Astrophysics* (2016)  
Presents the astrophysics input and sensitivity studies of the r-Java 2.0 computational code.
19. “r-Java 2.0: The nuclear physics”  
M. Kostka, N. Koning, Z. Shand, R. Ouyed & P. Jaikumar; *Astron.Astrophys.* 568, A97 (2014)  
Presents the nuclear physics input and systematics of the r-Java 2.0 computational code.
20. “The r-mode instability in strange stars with a crystalline crust ”  
G. Rupak, P. Jaikumar; *Physical Review C* 88, 065801 (2013)  
Computes rubbing friction at the core-crust interface of a quark star with phases of color superconducting quark matter at moderately high density, and its effect on limiting the spin rate of such stars.
21. “A spallation model for Ti-44 production in core-collapse supernovae”  
A. Ouyed, R. Ouyed, D. Leahy, P. Jaikumar; accepted for publication in *Reviews of Mexican Astronomy & Astrophysics* (2013)  
Presents a new model for Ti-44 overproduction and Ni-56 depletion seen in some sub-luminous supernovae such as Cas A, including mixing of supernova and quark-nova ejecta. Predicts overproduction of Be-7 and Na-22 as observable signatures.
22. “Neutrality of a magnetized two-flavor quark superconductor”  
T. Mandal & P. Jaikumar; *Physical Review C* 87, 045208 (2013)  
Investigates condensates and phase diagram in charge and color neutral magnetized two-flavor superconducting quark matter, suggesting a Clogston-Chandrasekhar limit in the magnetic gapless 2SC phase.
23. “Towards quark deconfinement in neutron stars via spindown: Gravitational waves or magnetic braking?” J. Staff, P. Jaikumar, Vincent (Paktoo) Chan & R. Ouyed; *The Astrophysical Journal* 751, 24, (2012).  
Presents a consistent calculation of the r-mode evolution and gravitational wave signal from isolated magnetized neutron stars and compares their role in spindown to that of magnetic braking.
24. “A spallation model for the titanium-rich supernova remnant Cassiopeia A”  
R. Ouyed, D. Leahy, A. Ouyed & P. Jaikumar, *Physical Review Letters* 107, 151103 (2011).  
Applies a spallation model of quark-nova ejecta on Nickel layer to explain the anomalous Titanium abundance of some supernovae such as Cas A.
25. “Quark-Novae in low-mass X-ray binaries II: Application to G87-7 and to GRB 110328A”

R. Ouyed, J. Staff & P. Jaikumar; *The Astrophysical Journal* 743, 116 (2011).

Applies the Quark-Nova model in white-dwarf/neutron star binaries to explain the composition of low-mass white dwarfs and extended emission features of GRB 110328A.

26. “r-Java : An r-process Code and Graphical User Interface for Heavy-Element Nucleosynthesis”  
C. Charignon, M. Kostka, N. Koning, P. Jaikumar, and R. Ouyed; *Astronomy & Astrophysics* 531, 79 (2011).

Introduced the r-java code, a programmable interface for r-process calculations for use by the nuclear physics community.

27. “Quark-Novae in Low-Mass X-ray Binaries with massive neutron stars I: A universal model for short-hard Gamma-Ray Bursts”

R. Ouyed, J. Staff, P. Jaikumar; *The Astrophysical Journal* 729, 60 (2011).

Applied the Quark-Nova model to neutron star/white dwarf binaries to explain common features of short and long GRBs.

28. “Neutrino cooling and spin-down of rapidly rotating compact stars”

P. Jaikumar & Stou Sandalski, *Physical Review D* 82, 103013 (2010).

Presents a consistent calculation of the r-mode evolution and neutrino-driven thermo-mechanical evolution of a compact star containing quark matter in an ungapped phase, with important results for the epoch of gravitational wave emission.

29. “Numerical Simulation of the Hydrodynamical Combustion to Strange Quark Matter”

B. Niebergal, R. Ouyed & P. Jaikumar, *Physical Review C* 82 (Rapid Communication), 062801 (2010).

Performs a numerical simulation of neutron matter burning to strange quark matter using advective as well as diffusive terms, including effects of neutrino energy loss from the system.

30. “Constraining phases of quark matter with studies of r-mode damping”

G. Rupak & P. Jaikumar, *Physical Review C* 82, 055806 (2010).

Calculates the r-mode frequency, critical spin frequency and damping rates due to bulk and shear viscosity in compact stars containing quark matter in the gapped CFL-K0 (kaon-condensed color-flavor-locked) phase.

31. “Quark-Novae, Cosmic Reionization and early r-process element production”

R. Ouyed, R. E. Pudritz & P. Jaikumar, *The Astrophysical Journal* 702, 1575 (2009).

Argues for an early cosmological reionizing source from phase transitions in neutron stars, computes the associated optical depth and postulates a link between early r-process nucleosynthetic abundances and reionizing photon flux.

32. “Viscous damping of r-mode oscillations in compact stars with quark matter”

P. Jaikumar, G. Rupak and A. W. Steiner, *Physical Review D* 78, 123007 (2008).

Calculates the r-mode frequency, critical spin frequency and damping rates due to bulk and shear viscosity in compact stars containing quark matter in ungapped and gapped superfluid phases.

33. “High-density Skyrmion matter and Neutron Stars”

P. Jaikumar, M. Bagchi and R. Ouyed, *The Astrophysical Journal* 678, 360 (2008).

Develops an effective field theory for a Skyrmion fluid model of dense matter with immediate applications to neutron star interiors.

34. “Muon production in low-energy electron-nucleon and electron-nucleus scattering”

P. Jaikumar, D. R. Phillips, L. Platter and M. Prakash, *Physical Review D* 76, 115001, (2007).

Identifies and computes the dominant background for signals of lepton-flavor-violating processes in electron-nucleon and electron-nucleus scattering at medium energies.

35. “Nucleosynthesis in decompressing neutron star matter”

P. Jaikumar, B. S. Meyer, K. Otsuki and R. Ouyed, *Astronomy and Astrophysics*, Volume 471, Issue 1, 227, (2007).

Investigates r-process nucleosynthesis in rapidly decompressing neutron matter ejected from the surface of a neutron star.

36. “Quark deconfinement in neutron star cores”

J. Staff, P. Jaikumar and R. Ouyed, *The Astrophysical Journal* 645, L145 (2006).

Estimates the spin-down timescale to quark deconfinement inside neutron star cores; discusses probability of finding quark matter inside neutron stars.

37. “Direct Urca neutrino rate in colour superconducting quark matter”

P. Jaikumar, A. Sedrakian and C. D. Roberts, *Physical Review C* 73, (Rapid Communication) 042801 (2006).

Establishes the importance of pair-breaking and formation of Cooper pairs for neutrino emission from quark matter.

38. “Skyrmion stars : Astrophysical motivations and implications”

P. Jaikumar and R. Ouyed, *The Astrophysical Journal* 639, 354 (2006).

Overview of Skyrmion star structure and cooling; first work to include the effects of asymmetric matter within the Skyrme model based equation of state.

39. “The strange star surface : A crust with nuggets”

P. Jaikumar, S. Reddy and A. W. Steiner, *Physical Review Letters* 96, 041101, (2005).

Addresses the energetics and structure of a mixed phase in the crust of quark stars.

40. “Sigma terms of light-quark Hadrons”

V. Flambaum, A. Hoell, P. Jaikumar, C. D. Roberts and S. V. Wright; *Few-Body Systems*, Springer-Verlag Wien ISSN: 0177-7963, (2005).

Computes the sigma-terms for light-quark mesons, the nucleon and the Delta using bound-state equations and the Feynman-Hellman theorem.

41. “Neutrino bremsstrahlung from a degenerate relativistic electron plasma”

P. Jaikumar, D. P. Page and C. Gale, *Physical Review D* 72, 123004 (2005).

Presents a revised estimate of neutrino bremsstrahlung from electron-electron collisions in astrophysical environments; includes for the first time the effects of Landau damping in such calculations.

42. “Neutrino emission and mass ejection in Quark-Novae”

P. Keranen, P. Jaikumar and R. Ouyed, *Astrophysical Journal* 614, 485 (2004).

Explores dynamical mass ejection from a neutron star due to a hadron-quark phase transition.

43. “Cosmology from moduli dynamics”

T. Biswas and P. Jaikumar, *Journal of High-Energy Physics* 0408, 053 (2004).

Investigates inflationary dynamics and post-inflationary evolution of the universe in the context of higher-dimensional theories.

44. “Bremsstrahlung photons from the surface of a bare strange quark star”

P. Jaikumar, D. Page, M. Prakash and C. Gale, *Physical Review D* 70, 023004 (2004).

Computes photon emission rates from the electrosphere of a bare quark star and presents dramatic observational signal for a quark star.

45. “Neutrino bremsstrahlung in neutron matter from magnetic moment interactions”

P. Jaikumar, K. R. S. Balaji and C. Gale, *Physical Review C* 69, 055804 (2004).

Calculates corrections to neutrino rates in astrophysics from a hypothetical magnetic moment for the neutrino.

46. “Quintessence and Inflation from symmetry breaking transition of the internal manifold”

T. Biswas and P. Jaikumar, *Physical Review D* 70, 044011 (2004).

Explores connection between cosmology and symmetry-breaking dynamics of an evolving extra dimension.

47. “Post-inflationary thermalization with hadronization scenario”

P. Jaikumar and A. Mazumdar, *Nuclear Physics B* 683, 264 (2004).

Presents qualitative features of the early universe QCD phase transition for low reheat temperatures.

48. “Neutrino bremsstrahlung in neutron matter from effective nuclear interactions”

A. Schwenk, P. Jaikumar and C. Gale, *Physics Letters B* 584, 241 (2004).

Computes many-body corrections to in-medium neutral current weak decay rates of neutrons in neutron matter.

49. “Ultra-high energy cosmic rays, cosmological constant, and  $\theta$ -vacua”

P. Jaikumar and A. Mazumdar: *Physical Review Letters* 90, 191301 (2003).

Conjectures on a link between cosmic rays and the cosmological constant based upon non-trivial windings of a higher gauge group in the standard model.

50. “Scalar-Isoscalar excitations in dense quark matter”

P. Jaikumar and I. Zahed, *Physical Review C* 67, 045202 (2003).

Calculates properties of the  $\sigma$ -meson in dense matter within a chiral effective model at high density.

51. “Neutrino emission from Goldstone modes in dense quark matter”

P. Jaikumar, M. Prakash and T. Schäfer, Physical Review D66, 063003 (2002).

Calculates weak decay rates in dense quark matter within a chiral effective model at high density.

52. “Photon and dilepton emission rates from high density quark matter”

P. Jaikumar, R. Rapp and I. Zahed, Physical Review C65, 055205 (2002).

Computes photon and dilepton emissivities in hot and dense quark matter of relevance to a possible deconfined phase in heavy-ion collisions.

53. “Cooper Pair Breaking and Recombination in Superfluid Quark Matter”

P. Jaikumar and M. Prakash, Physics Letters B516, 345 (2001).

First computation of cooper pair-breaking and formation effects on neutrino rates for a simple model of quark matter.

54. “BCS versus Overhauser pairing in dense (2+1)-dimensional QCD”

P. Jaikumar and I. Zahed, Physical Review D64, 014035 (2001).

Solves BCS gap equation for quark pairing in 2 space dimensions and investigates gauge dependence of the gluon propagator.

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## Conference Proceedings 11 - (#1-6 have CSULB by-line) - Student Names Underlined

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1. “Hadron-Quark Combustion as a Nonlinear, Dynamical System”

A. Ouyed, R. Ouyed, & P. Jaikumar, Universe 4, no.3, 51 (2018). Proceedings of the Conference on Compact Stars in the QCD phase diagram CSQCD VI, Dubna, Russia

2. “Oscillation modes of strange quark stars with a strangelet crust”

J. Asbell & P. Jaikumar, Journal of Physics: Conference Series 861, 012129 (2017).

Proceedings of the Conference on Compact Stars in the QCD phase diagram CSQCD V, Gran Sasso, Italy

3. “Explosive Combustion of a Neutron Star into a Quark Star: the non-premixed scenario”

R. Ouyed, B. Niebergal & P. Jaikumar, eConf C12-12-12 (2013).

Proceedings of the Conference on Compact Stars in the QCD phase diagram CSQCD III, Guarujá, Brazil

4. “Variation of Fundamental Constants from Big Bang to Atomic Clocks”

V. Flambaum, S. K. Chin, A. Nevsky, P. Jaikumar et al., Varying Fundamental Constants and Dynamical Dark Energy 1, 22 (2013).

Proceedings of the Meeting on Varying Fundamental Constants, Sexten Center for Astrophysics, Bolzano, Italy

5. “Predictions for signatures of the quark-nova in superluminous supernovae”

R. Ouyed, D. Leahy & P. Jaikumar, eConf 0905202 (2010).

Proceedings of the Conference on Compact Stars in the QCD phase diagram CSQCD II, Beijing, China

6. “Working group report: Quark gluon plasma”

P. Roy et al., Pramana: Indian Journal of Physics 72, 285 (2009).

Proceedings of the Xth workshop on high energy physics phenomenology (WHEPP X), Chennai, India, January 2008.

7. “Quark stars: Features and Findings”

P. Jaikumar, European Physical Journal C49, 199 (2007).

Proceedings of Hot Quarks 2006: Workshop in relativistic nucleus-nucleus collisions, Vilassimius, Sardinia, Italy, May 2006.

8. “Surface structure of quark stars with magnetic fields”

P. Jaikumar, Pramana: Indian Journal of Physics 67, 937 (2006).

Proceedings of IXth workshop on high energy physics phenomenology (WHEPP 9), Orissa, India, January 2006.

9. “Working Group Report: Heavy-Ion physics and Quark-Gluon Plasma”

M. G. Mustafa et al, Pramana: Indian Journal of Physics 67, 961 (2006).

Proceedings of IXth workshop on high energy physics phenomenology (WHEPP 9), Orissa, India, January 2006.

10. “Cosmology from moduli dynamics”

T. Biswas, P. Jaikumar, Int. J. Mod. Phys. A19, 5443 (2004).

Proceedings of the 26th Annual MRST Conference on High-Energy Physics (MRST 2004): From Quarks to Cosmology, Montreal, Canada, April 2004.

11 “Distinguishing bare quark stars from neutron stars”

P. Jaikumar, Charles Gale, Dany Page and Madappa Prakash, International Journal of Modern Physics A19, 5335 (2004).

26th Annual Conference on High-Energy Physics (MRST 2004): From Quarks to Cosmology, Montreal, Canada, April 2004.

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**Abstracts & Bulletins - 15 (#All have CSULB by-line) - Student Names Underlined**

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1. “Finite temperature effects on the g-modes of neutron stars”

Nick Lozano & P Jaikumar, Bulletin of the American Physical Society, Far West Section Meeting (2021)

2. “g-modes of neutron stars with hyperons”

Vinh Tran & P Jaikumar, Bulletin of the American Physical Society, Far West Section Meeting (2021)

3. “Identifying the Quark-Hadron Phase Transition in Neutron Stars with -modes”

Megan Barry & P Jaikumar, Bulletin of the American Physical Society, Far West Section Meeting (2019)

4. “Calculation of Primary Variables Affecting the g-mode Oscillations in Neutron Stars”

Megan Barry & P Jaikumar, Bulletin of the American Physical Society, Far West Section Meeting (2018)

5. “The Effects of Superfluidity on the Oscillation Modes of Compact Stars”

Raphael Monroy & P Jaikumar, Bulletin of the American Physical Society, Far West Section Meeting (2017)

6. “General Relativistic Non-radial Oscillations of Compact Stars”

Zack Hall & P Jaikumar, Bulletin of the American Physical Society, April Meeting (2017)

7. “Core Deuterium Fusion and Radius Inflation in Hot Jupiters”

P Jaikumar & R Ouyed, American Astronomical Society Meeting Abstracts 228 (2016)

8. “Non-radial Modes of Oscillation in Neutron Stars and Quark Stars: Modes f, p and g”

Jessica Asbell & P Jaikumar, Bulletin of the American Physical Society, Far West Section Meeting (2015)

9. “Nucleon Neutral Weak Form Factors from AdS/QCD Correspondence”

M Lohmann, & P Jaikumar, Bulletin of the American Physical Society 58, (2013)

10. “r-modes in Strange Stars with a Crystalline Crust”

P Jaikumar, Bulletin of the American Physical Society, Far West Section Meeting (2013)

11. “r-Java: a GUI-based code for nucleosynthesis calculations”

J Arenson, & P Jaikumar, Bulletin of the American Physical Society, Far West Section Meeting (2013)

12. “Fluid Oscillations of Neutron and Quark Stars”

A Bandari & P Jaikumar, Bulletin of the American Physical Society, Far West Section Meeting (2013)

13. “r-modes in Quark Stars with a Crystalline Superconducting Crust”



G Rupak & P Jaikumar, APS Division of Nuclear Physics Meeting Abstracts 1 (2012)

14. “Coalescing Compact Binaries with Quark Star Component”

S Koshy, P Jaikumar, M Vallisneri, APS California Section Meeting Abstracts 1 (2011)

15. “GPU based SPH simulations of the compact binary coalescence”

S Sandalski & P Jaikumar, APS April Meeting Abstracts 1, 1004 (2011)

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### **Invited Review Articles - 1**

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1. “Quark matter in neutron stars: an apercu”

P. Jaikumar, S. Reddy and A. W. Steiner, Modern Physics Letters A21, 1965 (2006).

Topical review of the theoretical and observational status of quark matter inside neutron stars.

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### **Papers under Peer-review - 0**

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## Citation Summary (January 2020)

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h-index: 19  
i10 index: 37

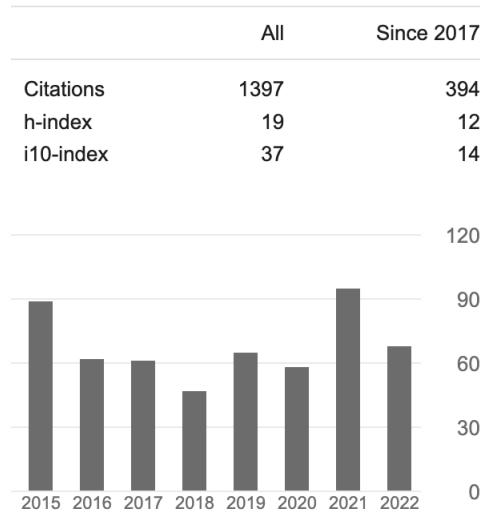


figure 1: The h-index is a suggested measure of productivity among research physicists - A full professor of Physics at a major research university has a typical h-index of 18 (ref. J. Hirsch, “An index to quantify an individual’s scientific research output”, PNAS 102 (46), 16569 (2005)). The i10 index is the number of papers with more than 10 citations.

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Downloadable electronic versions of all my papers are at <http://www.slac.stanford.edu/spires/hep/>

### Conferences & Workshops

(\* = Organized or was involved in Steering Committee)

**Annual Meeting of the Far West Section, Honolulu, Hawaii** *October 7-8, 2022*  
Annual APS CA-NV section meeting

**\*CSQCD IX, Banff, Canada** *August 1-5, 2022*  
Biennial meeting on compact stars and the QCD phase diagram

**Annual Meeting of the Far West Section, Virtual Meeting** *October 29-30, 2021*  
Annual APS CA-NV section meeting

**Annual Meeting of the Far West Section, Virtual Meeting** *October 29-30, 2021*  
Annual APS CA-NV section meeting

**Annual Meeting of the Far West Section, CSU Fullerton, California** *October 18-20, 2018*  
Annual APS CA-NV section meeting

**\*CSQCD, CUNY Graduate Science Center, New York** *June 11-15, 2018*  
Meeting on compact stars and dense QCD

**Astro-Solids and Gravitational Waves, U. Washington, Seattle** *April 16-20, 2018*  
Workshop on solid phases in neutron stars and gravitational waves

**Annual Meeting of the Far West Section, UC Merced, California** *November 3-4, 2017*

Annual APS CA-NV section meeting

**Light, Color and Dense Matter, University of Minnesota** *June 12-14, 2017*  
Workshop on heavy-ion collisions and QCD

**American Physical Society Section Meeting, Davis, California** *Oct 28-29, 2016*  
Annual APS CA-NV section meeting

**CSQCD V, Gran Sasso, Italy** *May 22-28, 2016*  
Meeting on compact stars and dense QCD

**American Physical Society Section Meeting, Long Beach, California** *Oct 31-Nov 2, 2015*  
Annual APS CA-NV section meeting

**American Physical Society Section Meeting, Sonoma, California** *Nov 1-2, 2013*  
Annual APS CA-NV section meeting

**\*CSQCD III, Guarujá, Brazil** *Dec 12-15, 2012*  
Meeting on compact stars and dense QCD

**Division of Nuclear Physics Meeting, Anaheim, California** *Oct 24-27, 2012*  
Annual APS meeting in Nuclear Physics

**COMPSTAR, Papeete, Tahiti** *May 4-11, 2012*  
Conference on astrophysics of compact objects

**Workshop on Neutrinos and Neutron Stars, Tempe, Arizona** *Mar 26-27, 2012*  
4th Workshop on strong gravity and particle physics in Neutron stars

**APS CA-NV Section meeting, SLAC, California** *Nov 9-11, 2011*  
Section meeting of the American Physical Society

**Workshop on Neutrinos and Neutron Stars, Tempe, Arizona** *Mar 27-28, 2011*  
3rd Workshop on strong gravity and particle physics in Neutron stars

**West Coast Anacapa Society Meeting, Pomona, California** *Dec 9-10, 2010*  
Meeting of theoretical/computational physicists from UG institutions on US West Coast

**Division of Nuclear Physics Meeting, Santa Fe, New Mexico** *Oct 23-26, 2010*  
Annual APS meeting in Nuclear Physics

**2nd Workshop on Neutrinos and Neutron Stars, Tempe, Arizona** *April 12-13, 2010*  
Workshop on strong gravity and particle physics in Neutron stars

**From First Light to Newborn stars, Tucson, Arizona** *March 14-17, 2010*  
NOAO Conference on Star formation and Galaxies

**\*CSQCD II, Beijing, China** *May 20-24, 2009*  
Meeting on compact stars and dense QCD

**\* NuPAC, Chennai, India** *April 5-7, 2009*  
Satellite meeting on Neutrinos in Particle Astrophysics & Cosmology

<b>DAE-BRNS symposium, Benares, India</b> Symposium on high-energy physics	<i>Dec 14-18, 2008</i>
<b>Workshop on Equation of state in Astrophysics, Argonne, Illinois</b> International workshop on the equation of state of matter	<i>Aug 25-29, 2008</i>
<b>Astrophysics of quark matter, Orissa, India</b> International meeting on quarks in astrophysics	<i>Feb 14-17, 2008</i>
<b>Quark matter 2008, Jaipur, India</b> International meeting on heavy-ion physics	<i>Feb 4-10, 2008</i>
<b>*WHEPP-X, Chennai, India</b> Workshop on high-energy particle physics phenomenology	<i>Jan 4-12, 2008</i>
<b>CASCA Bicentennial meeting, Calgary, Canada</b> International meeting of the Canadian Astronomical Society	<i>June 1-4, 2006</i>
<b>Hot Quarks 2006, Sardinia, Italy</b> International workshop on ultra-relativistic heavy-ion collisions	<i>May 15-20, 2006</i>
<b>WHEPP-9, Orissa, India</b> International workshop on high-energy physics phenomenology	<i>Jan 3-14, 2006</i>
<b>Mid-west Theory Get-Together, Argonne, Illinois</b> Annual meeting of nuclear physicists from universities in the US mid-west.	<i>Fall 2004,2005,2006,2008</i>
<b>Division of Nuclear Physics Meeting, Chicago, Illinois</b> Meeting of American Physical Society's Division of Nuclear Physics.	<i>Oct 27-30, 2004</i>
<b>Montreal-Rochester-Syracuse-Toronto Conference (MRST), Montreal, Quebec</b> <i>2004</i> Conference on high energy physics from Quarks to Cosmology; Montreal, Canada.	<i>May 12-14</i>
<b>Quark Matter 2004, Oakland, California</b> International conference on ultra-relativistic heavy-ion collisions.	<i>Jan 11-17, 2004</i>
<b>Chiral Dynamics of Hadrons and Hadrons in a medium, Burjassot, Spain</b> Workshop on chiral nuclear dynamics, U. Valencia, Spain.	<i>June 26-28, 2003</i>
<b>Topics in Heavy-Ion Collisions, Montreal, Quebec</b> International conference on heavy-ion collisions.	<i>May 26-28, 2003</i>
<b>XIIIth Nuclear Physics Summer School, Bar Harbor, Maine</b> Lectures on special topics in Nuclear Physics.	<i>June 12-22, 2001</i>
<b>Quark Matter 2001, Stony Brook, New York</b> International conference on ultra-relativistic heavy-ion collisions.	<i>Jan 15-20, 2001</i>

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## Extended Visits for Scientific Collaboration

<b>Institute of Mathematical Sciences, Chennai, India</b> (Host: M. Bagchi)	<i>July 7-12, 2019</i>
<b>Mississippi State University; Starkville, USA</b> (Host: G. Rupak)	<i>June 25-30, 2016</i>
<b>University of Calgary; Calgary, Canada</b> (Host: R. Ouyed)	<i>January 3-10, 2015</i>
<b>Mississippi State University; Starkville, USA</b> (Host: G. Rupak)	<i>July 7-14, 2013</i>
<b>TRIUMF; Vancouver, Canada</b> (Host: A. Schwenk)	<i>Aug 11-16, 2008</i>
<b>Physical Research Laboratory; Gujarat, India</b> (Host: H. Mishra)	<i>Oct 28-Nov 2, 2007</i>
<b>Canadian Institute for Theoretical Astrophysics; Toronto, Canada</b> (Hosts: R. Ouyed & K. Mori)	<i>Nov 12-19, 2006</i>
<b>Los Alamos National Laboratory; New Mexico, USA</b> (Host: S. Reddy)	<i>Jun 4-8, 2005</i>
<b>McMaster University; Ontario, Canada</b> (Host: R. Bhaduri)	<i>July 4-8, 2004</i>
<b>Stony Brook University; New York, USA</b> (Host: M. Prakash)	<i>Aug 16-23, 2003</i>
<b>Ohio State University; Ohio, USA</b> (Host: A. Schwenk)	<i>Aug 9-15, 2003</i>

## **Presentations**

- g-mode oscillations of neutron and hybrid stars**  
Invited Talk, CSQCD conference, Banff, Canada (August 2022),
- Using neutron star oscillations to discover new phases of matter**  
Invited Colloquium, CSU Los Angeles (October 2021),
- Non-radial oscillations of compact stars**  
Invited Talk, Nuclear Physics Summer School, Brazil (virtual) (August 2021),
- Uncovering new phases of matter with g-mode oscillations of compact stars**  
Invited Talk, N3AS Collaboration (June 2021),
- g-mode oscillations of compact stars and their gravitational wave signature**  
Invited Talk, Ohio University (April 2021),
- Non-radial oscillations of compact stars and their gravitational wave signature**  
Invited Talk, IMSc Chennai (July 2019),

7. **Probing neutron stars with oscillation modes**  
Invited Talk, CSU Northridge (April 2019),
8. **Effects of strange quark matter on non-radial oscillations of compact stars**  
Invited Talk, Graduate Science Center, CUNY New York (June 2018),
9. **Non-radial oscillation modes of strange stars**  
Invited Talk, INT Seattle (April 2018),
10. **Hydrodynamics of Neutron Star Oscillations: Imprint of Quark Matter**  
Invited Talk, University of Minnesota (June 2017),
11. **Probing Cold Dense Matter with Compact Star Oscillations**  
Colloquium, Kent State University (April 2017),
12. **Vibrating neutron stars**  
Colloquium, CSU Long Beach (October 2016),
13. **Astrophysics of Strange Star Crusts**  
Invited Talk, Gran Sasso, Italy (May 2016),
14. **Cosmic ringtones from gravitational waves**  
Outreach Talk, CSU Long Beach (March 2016),
15. **Compact star oscillations and the equation of state**  
Colloquium, University of Calgary, Canada (January 2016),
16. **Non-radial oscillations of Neutron Stars**  
Seminar, INPP, Ohio University, Ohio (March 2015),
17. **Neutron stars as astrophysical testbeds of dense matter**  
Invited Colloquium, San Diego State University, San Diego (January 2014),
18. **Nucleosynthesis calculations using a GUI-based module**  
Invited Colloquium, CSU Dominguez Hills (November 2013),
19. **r-modes in strange stars with a crystalline crust**  
Submitted Talk, APS CA-NV section meeting, Sonoma (November 2013),
20. **Neutron stars and Nucleosynthesis**  
Invited Colloquium, TRIUMF, Vancouver (October 2013),
21. **Using r-modes to probe equations of state for neutron stars**  
Invited Talk, TRIUMF, Vancouver (May 2013),
22. **Neutron stars as billion degree superconductors**  
Invited Colloquium, CSU Fullerton, Fullerton (May 2013),
23. **r-modes, equation of state and spin down of neutron stars**  
Invited Talk, Texas A& M University, College Station (April 2013),
24. **Cosmic secrets unlocked: Bright & Dark sides of our Universe**  
Public Talk at alumni fundraiser, CSU Long Beach (March 2013),

25. **The quark-hadron phase transition in neutron stars**  
Invited Talk, IIMSc, Chennai, India (January 2013),
26. **r-mode braking in crystalline phases of dense QCD**  
Conference Talk, Division of Nuclear Physics Meeting, Anaheim (October 2012),
27. **Emergence of quark phase in neutron stars: gravitational wave signals**  
Invited Talk, COMPSTAR, Tahiti (May 2012),
28. **A colorful take on superconductivity**  
Invited Colloquium, San Diego State University, San Diego (November 2011),
29. **Gravitational waves and spin down of young neutron stars**  
Invited Talk, Workshop on Neutrinos and Neutron Stars, Arizona State University, Tempe (April 2011),
30. **r-mode driven spin down of rapidly rotating compact stars**  
Conference Talk, West Coast Anacapa Society Meeting, CSU Pomona (December 2010),
31. **Neutrino cooling and spin down of rapidly rotating compact stars**  
Conference Talk, Division of Nuclear Physics Meeting, Santa Fe (October 2010),
32. **Fossil neutron stars as fuel for nucleosynthesis**  
Invited Colloquium, California State University Fresno, Fresno (October 2010),
33. **R-mode damping and neutrino cooling of neutron stars**  
Invited Talk, Workshop on Neutrinos and Neutron Stars, Arizona State University, Tempe (April 2010),
34. **Fossil neutron stars as fuel for nucleosynthesis**  
Invited Colloquium, California State University Los Angeles, Los Angeles (March 2010),
35. **Neutrino rates in dense quark matter**  
Invited Talk, ICTS program on Aspects of Neutrinos, Goa, India (April 2009),
36. **Neutrino rates and cooling of neutron stars**  
Conference Talk, Neutrinos in Particle Astrophysics & Cosmology, Mahabalipuram, India (April 2009),
37. **Neutron stars: Astrophysical laboratories for superdense matter**  
Invited Talk, California State University Long Beach, California (February 2009),
38. **Astrophysics of Quark Matter**  
Plenary Talk, DAE-symposium on high-energy physics, Benares, India (December 2008),
39. **r-modes and critical spin frequency of compact stars**  
Workshop on equation of state in Astrophysics, Argonne (August 2008),
40. **r-mode instability and critical rotation rates of compact stars**  
The Ohio State University, Columbus (July 2008),
41. **Neutron stars, the Equation of State and the r-process**  
The University of Chicago, Chicago (June 2008),
42. **Neutron stars: Astrophysical laboratories for nuclear and sub-nuclear physics**  
Argonne National Laboratory, Argonne (June 2008),

43. **r-modes in color superconducting matter**  
Toshali Sands, Bhubaneswar, India (February 2008),
44. **High-density matter and neutron stars**  
Physical Research Laboratory, Ahmedabad, India (October 2007),
45. **r-process nucleosynthesis from decompression of neutron star matter**  
North Carolina State University, Raleigh (February 2007),
46. **r-process in a low-entropy environment**  
JINA collaboration meeting, Michigan State University, East Lansing (February 2007),
47. **The Quark-Nova Scenario and r-process nucleosynthesis**  
CASCA Bicentennial meeting, Calgary, Canada (June 2006),
48. **Nucleosynthesis in a low-entropy environment**  
Washington University at St. Louis, Missouri (May 2006),
49. **Nucleosynthesis: From quarks to stars**  
Institute of Mathematical Sciences, Chennai, India (January 2006),
50. **Microphysics of QCD and Quark stars**  
Tata Institute of Fundamental research, Mumbai, India (January 2006),
51. **On Quark star structure and observational signals**  
Workshop on High-Energy Physics Phenomenology, Institute of Physics (IOP), Bhubaneswar, Orissa, India (January 2006),
52. **The Quark Nova as a site for the r-process**  
Canadian Institute for Theoretical Astrophysics (CITA), Toronto, Canada (November 2005),
53. **Mass-radius relations for solitonic stars**  
McGill University, Montreal, Canada (July 2005),
54. **Strange stars have strange surfaces**  
Los Alamos National Laboratory, Los Alamos, New Mexico (June 2005),
55. **The nuclear astrophysics of dense quark matter**  
Ohio University, Athens, Ohio (April 2005),
56. **Quarks in Neutron stars : A new paradigm in astrophysics**  
Colloquium, University of Calgary, Calgary, Canada (March 2005),
57. **r-process nucleosynthesis in compact stars**  
McGill University, Montreal, Canada (February 2005),
58. **The many phases of dense quark matter**  
Colloquium, Tata Institute of Fundamental Research, Mumbai, India (August 2004),
59. **Color superconductivity in Neutron stars**  
Institute of Mathematical Sciences, Chennai, India (July 2004),
60. **Surface photon emission from quark stars**  
Institute for Nuclear Theory, Seattle, Washington (April 2004),



61. **Color superconductivity in dense quark matter**  
Argonne National Laboratory, Argonne (February 2004),
62. **Photon and neutrino emission rates for bare quark stars**  
Ohio State University, Columbus (August 2003),
63. **BCS versus Overhauser pairing in dense QCD**  
Brookhaven National Laboratory, Upton, New York (January 2002),