

# Christopher Lang, Ph.D.

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🐙 <https://github.com/cjang96>



## Education

- 2020 – 2024    📖 **Ph.D., University of Waterloo**  
Pure Mathematics - Thesis title: *Solitons with continuous symmetries*
- 2019 – 2020    📖 **Master of Advanced Study, University of Cambridge (Queens' College)**  
Mathematics
- 2014 – 2019    📖 **BMath, Co-op, University of Waterloo**  
Mathematical Physics and Pure Mathematics

## Research

### Journal Articles


- 1    **C. J. Lang**, “Hyperbolic monopoles with continuous symmetries,” *Journal of Geometry and Physics*, vol. 203, p. 105 258, 2024, ISSN: 0393-0440. 🌐 DOI: 10.1016/j.geomphys.2024.105258. arXiv: 2310.10626.
- 2    B. Charbonneau, A. Dayaprema, **C. J. Lang**, Á. Nagy, and H. Yu, “Construction of Nahm data and BPS monopoles with continuous symmetries,” *Journal of Mathematical Physics*, vol. 63, no. 1, p. 013 507, 2022, **Editor’s Pick**, ISSN: 0022-2488. 🌐 DOI: 10.1063/5.0055913. arXiv: 2102.01657.
- 3    **C. J. Lang** and M. L. Waite, “Scale-dependent anisotropy in forced stratified turbulence,” *Physical Review Fluids*, vol. 4, p. 044 801, 4 2019. 🌐 DOI: 10.1103/PhysRevFluids.4.044801.

### Invited Talks

- 1    *Instantons with continuous symmetries*, Geometric Models of Matter, University of Leeds, Aug. 2024. 🌐 URL: <https://www.youtube.com/watch?v=a5dZKpBPkxQ&>.
- 2    *Spherically symmetric hyperbolic monopoles*, CMS Winter Meeting, Dec. 2023.
- 3    *Spherically symmetric hyperbolic monopoles*, Colloquium talk, Memorial University of Newfoundland, Oct. 2023.
- 4    *Revisiting symmetric hyperbolic monopoles*, Differential Geometry Working Seminar, University of Waterloo, Jul. 2023.
- 5    *Hyperbolic monopoles with continuous symmetries (Part 2)*, Differential Geometry Working Seminar, University of Waterloo, Mar. 2023.
- 6    *Hyperbolic monopoles with continuous symmetries*, Differential Geometry Working Seminar, University of Waterloo, Nov. 2022.
- 7    *Understanding and mitigating student resistance to active learning*, Graduate Students in Teaching Conference, University of British Columbia, May 2022.
- 8    *The spectral curve of a  $SU(2)$  monopole (Part 2): Identifying subbundles*, Differential Geometry Working Seminar, University of Waterloo, Apr. 2022.
- 9    *Understanding and mitigating student resistance to active learning*, Teaching and Learning Conference, University of Waterloo, Apr. 2022.




- 10 *The spectral curve of a  $SU(2)$  monopole (Part 1): A holomorphic vector bundle*, Differential Geometry Working Seminar, University of Waterloo, Mar. 2022.
- 11 *Constructing BPS monopoles with spherical symmetry*, Oxford–London Gauge Assembly, University College London, Jun. 2021.
- 12 *Constructing Nahm data and BPS monopoles with continuous symmetries*, Ottawa Mathematics Conference, University of Ottawa, May 2021.
- 13 *Constructing BPS monopoles with spherical symmetry*, GSTGC, Indiana University, Apr. 2021.
- 14 *On the charge density and asymptotic tail of a monopole*, Differential Geometry Working Seminar, University of Waterloo, Mar. 2021.
- 15 *The many faces of monopoles*, Differential Geometry Working Seminar, University of Waterloo, Feb. 2021.
- 16 *Using group actions to simplify differential equations*, Part III Seminar Series, University of Cambridge, Dec. 2019.
- 17 *Simplifying Nahm data with group actions*, CUMC, Queen's University, Jul. 2019.
- 18 *The ADHM–Nahm procedure*, Geometry Seminar, University of Waterloo, Jun. 2019.
- 19 *Simplifying Nahm data with group actions*, Geometry Seminar, University of Waterloo, May 2019.
- 20 *Local isotropy in stratified turbulence*, USRA Mini-Conference, University of Waterloo, Aug. 2018.

## Thesis

- 1 **C. J. Lang**, “Solitons with continuous symmetries,” Ph.D. Thesis, University of Waterloo, Waterloo, Canada, 2024.  URL: <https://hdl.handle.net/10012/20906>.

## Teaching

### Certifications

- |           |   |   |
|-----------|---|---|
| Mar. 2022 |  | Certificate in University Teaching        |
| Dec. 2020 |  | Fundamentals of University Teaching       |
| Nov. 2020 |  | Certificate in Online Course Facilitation |






### Lecturing

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|------------|---|---|
| Fall, 2022 |  | MATH 137 - Calculus I for Honours Mathematics, University of Waterloo |
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## Programming Skills




Fortran, Maple, Git,  $\text{\LaTeX}$

## Awards

- |           |   |                                      |
|-----------|---|--------------------------------------|
| 2023–2024 |  | Rai Mathematics Graduate Scholarship |
|           |  | Ontario Graduate Scholarship         |
| 2022      |  | Outstanding Teaching Assistant Award |
| 2020–2023 |  | Alexander Graham Bell CGS - Doctoral |
| 2020–2024 |  | President's Graduate Scholarship     |

## Awards (continued)

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- 2019      Jessie Zou Excellence in Research (Finalist)  
            NSERC CGS - Masters (Declined)  
2016, 2018 & 2019      NSERC Undergraduate Student Research Award









## Areas of Interest

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Lie theory, moduli spaces, and gauge theory—specifically instantons and monopoles

## References

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- Research      **Dr. Benoit Charbonneau**  
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Department of Pure Mathematics  
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-  **Dr. Ruxandra Moraru**  
University of Waterloo  
Department of Pure Mathematics  
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-  **Dr. Ákos Nagy**  
BEIT Canada  
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- Teaching      **Dr. Blake Madill**  
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