

# CV - Jeremy B. Hume

**Email:** jeremybhume@gmail.com

**Nationality:** Canadian

**Website:** <https://jeremybhume.github.io/>

## Education and Academic Employment

---

**Postdoctoral Fellow**, Mathematics  
Carleton University (Supervisor: Charles Starling)

*January 2025 - December 2025*

**PhD**, Mathematics  
University of Glasgow (Supervisor: Xin Li)

*September 2021 - December 2024*

**MSc**, Mathematics  
University of Victoria (Supervisor: Ian F. Putnam)

*September 2019 - August 2021*

**H.BSc**, Mathematics  
University of Toronto

*September 2015 - May 2019*

## Research Interests

---

$C^*$ -algebras,  $K$ -theory, groupoids and dynamical systems.

## Recent Projects

---

### $KK$ -duality for self-similar groupoid actions on graphs

arxiv:2302.03989 (published in Transactions of the American Mathematical Society). Joint with N. Brownlowe, A. Buss, D. Gonçalves, A. Sims and M. F. Whittaker. We prove that two naturally associated  $C^*$ -algebras to a regular and contracting self-similar groupoid are Spanier-Whitehead dual (in  $KK$ -theory) to each other by showing they are strongly Morita equivalent to the stable and unstable Ruelle  $C^*$ -algebras of a Smale space arising from the self-similar limit space.

### The $K$ -theory of the $C^*$ -algebras associated to a rational function

arxiv:2307.13420 (submitted). We compute the  $K$ -theory of the three  $C^*$ -algebras associated to a rational function, thought of as a dynamical system acting on its Julia set, Fatou set or the entire Riemann sphere. Our results yield new dynamical invariants for rational functions and a  $C^*$ -algebraic formulation of the Density of Hyperbolicity Conjecture for quadratic polynomials.

### Katsura's self-similar groupoid actions, Putnam's binary factors, and their limit spaces

arxiv:2405.19863 (Invited submission to a special edition of the Journal of the Australian Mathematical Society in honour of Iain Raeburn). Joint with M. F. Whittaker. We investigate the properties of a certain class of self-similar groupoid actions, the *Katsura actions*. We show a recent class of dynamical systems studied by Putnam can be realized as a sub-class of the limit space dynamical systems associated to Katsura actions. We prove these limit spaces embed into the plane, answering a question of Putnam.

### Minimal covers with continuity-preserving transfer operators for topological dynamical systems

arXiv:2408.11917. Joint with K. A. Brix and X. Li. To a non-invertible dynamical system we construct two covers of it by better behaved systems, generalizing the Krieger and Fischer covers of a sub-shift. We show these covers are functorial, have universal properties and study the relationship between properties of the original system and properties of the cover.

### Renormalization procedures for $C^*$ -algebras

(MSc. Thesis) (<http://hdl.handle.net/1828/13285>). We introduce renormalization procedures for  $C^*$ -algebras, in analogy to renormalization procedures for families of dynamical systems. We prove a  $C^*$ -analog to Masur's unique ergodicity criterion for flat surfaces and apply this criterion to show a variety of  $C^*$ -algebras have unique trace.

## Recent Invited and Contributed Talks

---

**Operator Algebra Seminar**, University of Southern Denmark, Odense, Denmark  
(Invited talk: Dynamical covers)

*November 2024*

**Functional Analysis Seminar**, University of Oxford, England  
(Invited talk: Spectral gap in the operator on traces induced from a  $C^*$ -correspondence)

*November 2024*

**Operator Algebras in the South of the UK**, Southampton, England  
(Invited talk: The  $K$ -theory of the  $C^*$ -algebras associated to complex dynamical systems)

*September 2024*

**OdenSeaG**, Odense, Denmark  
(Invited talk: Contracting  $C^*$ -correspondences)

*August 2024*

<b>UK Operator Algebras Conference</b> , Newcastle, England (Contributed talk: Katsura groupoid actions and their limit spaces)	<i>June 2024</i>
<b>YMC*A 2023</b> , Leuven, Belgium (Contributed talk: The $K$ -theory of a rational function)	<i>August 2023</i>
<b>Algebra, Geometry and <math>C^*</math>-algebras</b> , ICMS, Edinburgh, Scotland (Invited talk: The $K$ -theory of a rational function)	<i>June 2023</i>
<b>Analysis seminar</b> University of Waterloo, Canada (Invited talk: The $K$ -theory of a rational function)	<i>January 2023</i>

## Organizing

---

<b>YMC*A 2024</b> , University of Glasgow, Scotland I led the organizing committee for “Young Mathematicians in $C^*$ -algebras”, which was an international conference designed for early career researchers working in the field of operator algebras. The number of participants was 115.	<i>August 2024</i>
<b>Analysis working seminar</b> , University of Glasgow, Scotland I organized with two fellow PhD students a weekly seminar for members of the analysis department and visiting scholars to present topics related to their research.	<i>September 2022 - April 2023</i>

## Teaching

---

<b>Complex analysis tutorial</b> , University of Glasgow, Scotland I led the 4 <sup>th</sup> year honours complex analysis tutorial where I taught supplemental material and went through problem set exercises carefully with students.	<i>Winter 2021</i>
<b>Teichmüller theory seminar</b> , University of Victoria, Canada I hosted a Teichmüller theory seminar at the University of Victoria and gave two one-hour lectures each week.	<i>Fall 2019</i>
<b>Calculus</b> , Toronto, Canada I taught an approximately 100-hour-long course on high-school level calculus to an individual through Forest Hill Tutoring Company in Toronto.	<i>July 2019</i>

## Awards and Scholarships

---

<b>Heilbronn Institute’s Small Grant Award for YMC*A 2024</b> <sup>3</sup> £3500 GBP	<i>2024</i>
<b>Glasgow Mathematical Journal Trust Award for YMC*A 2024</b> <sup>2</sup> £3000 GBP	<i>2024</i>
<b>University of Glasgow Graduate Scholarship</b> <sup>1</sup> £60 000 GBP	<i>2021</i>
<b>British Columbia Graduate Scholarship</b> \$15 000 CAD	<i>2019</i>
<b>University of Victoria Graduate Award</b> \$4872 CAD	<i>2019</i>
<b>Margaret Ronald Taylor &amp; Thomas Paxton Taylor Scholarship</b> \$1414 CAD	<i>2019</i>
<b>Dean’s List (University of Toronto)</b>	<i>2016, 2017, 2018</i>
<b>F Ray Irwin Scholarship</b> \$1000 CAD	<i>2018</i>
<b>Regents In-Course Scholarship</b> \$1000 CAD	<i>2017</i>
<b>Dr John Benjamin Gullen Scholarship</b> \$1000 CAD	<i>2016</i>
<b>President’s Entrance Scholarship</b> \$2000 CAD	<i>2015</i>

---

<sup>3</sup>(Conference grant, joint with U. Chakraborty, J. Gonzales, F. Pagliuca and S. Pilgrim)

<sup>2</sup>(Conference grant, joint with F. Pagliuca)

<sup>1</sup>(funded through ERC grant No. 817597)