

# Chas Nelson

*PhD, MSci*

## Current Position

2018–current **EPSRC Doctoral Prize Research Fellow**, *University of Glasgow*, Glasgow, UK.  
Building optical and neuronal simulations of the zebrafish retina to explore the possibility of combining light sheet microscopy and graph theoretics to interrogate zebrafish retinal development.

## Employment

2017–2018 **Research Assistant in Microscopy and Optics**, *University of Glasgow*, Glasgow, UK.  
Combining real-time image processing with low phototoxicity microscopy to capture synchronised 3D images of the *in vivo*, beating zebrafish heart.

## Education

2013–2017 **PhD in Computer Science**, *Durham University*, Durham, UK.  
Mathematical Morphology for Quantification in Biological & Medical Image Analysis

2009–2013 **Master of Science**, *Durham University*, Durham, UK, *First Class Honours*.  
Biology & Physics within the Natural Sciences Programme

## PhD Thesis

Title *Mathematical Morphology for Quantification in Biological & Medical Image Analysis*

Supervisor Dr Boguslaw Obara

Description

- Developing, validating & disseminating image analysis & processing solutions
- Vessel enhancement based on morphological operations
- Automated and accurate nuclei detection in fluorescent micrographs
- Brain vasculature segmentation and aneurysm highlighting in MRA images

## Masters Thesis

Title *The Scratch Wound Assay: Scratching Away at Cancer with Image Analysis*

Supervisor Prof. Chris Hutchison

Description

- Developed a scratch wound assay analysis solution capable of tracking individual cells & of analysing wound area

## Experiences

### Research-related

2018–2019 **Undergraduate Supervisor**, *School of Physics and Astronomy*, University of Glasgow, UK.

- Designed and supervised the undergraduate research projects of two students
- Guided students through theory, experimental design, programming, research and reporting
- Provided pastoral support for getting summer interships and applying for further study and jobs

*University of Glasgow – Glasgow, UK G12 8QQ*

☎ +44 7891 077 729 • ✉ [chas.nelson@glasgow.ac.uk](mailto:chas.nelson@glasgow.ac.uk) • 🌐 [chasnelson.co.uk](http://chasnelson.co.uk)  
in [ChasNelson1990](https://www.linkedin.com/company/ChasNelson1990) • 🐦 [@chas\\_nelson\\_](https://twitter.com/chas_nelson_) • 🐕 [DizzyHound](https://www.instagram.com/DizzyHound)  
*Blog: The Little Eye* 📖

- 2018 **Vacation Scholarship Supervisor**, *School of Physics and Astronomy*, University of Glasgow, UK.
- o Successfully applied for EPSRC funding to support an undergraduate student during a ten week summer research project
  - o Designed a coherent research programme for the student and supervised them throughout the project
  - o Guided student through complex theory, experimental design, data analysis and presenting skills
- 2017 **Conference Organiser**, *Glasgow Imaging Network*, University Glasgow, UK.
- o Organised a one-day conference to bring together life scientists, physicists and engineers working on the development or use of imaging technologies
  - o The conference was a great success with 23% of attendees having established new collaborations due to the meeting
- 2016–2017 **Undergraduate Supervisor**, *School of Engineering & Computing Sciences*, Durham, UK.
- o Designed and supervised the undergraduate research projects of three students
  - o The report of one of Frank Ryan was highly commended in the 2016 Undergraduate Awards
  - o Guided students through theory, experimental design, programming, research and reporting
  - o Provided pastoral support for getting summer internships and applying for further study and jobs
- 2015–2017 **Founder Journal Club**, *School of Engineering & Computing Sciences*, Durham University, UK.
- o Founded the Vision Journal Club to help postgraduates develop their critical analysis skills
  - o The club focuses on image processing, computer vision & visualisation papers
  - o Chaired the club, organising papers & leading discussions
- 2015–2017 **Junior Seminars Chair**, *School of Engineering & Computing Sciences*, Durham University, UK.
- o Chaired the Computer Science Junior Seminar series of lectures
  - o Invited speakers & organised sessions across a range of areas of interest

### Teaching

- 2018–2019 **Python Computing Course**, *School of Physics and Astronomy*, University of Glasgow, UK.
- o Developed a new Python programming course for the level 2 Physics undergraduate module
  - o Designed new teaching materials within the Jupyter Notebooks framework
- 2017–2018 **Polarisation Practical Lab Design**, *School of Physics and Astronomy*, University of Glasgow, UK.
- o Developed a new lab for the level 2 physics undergraduate module
  - o Whilst the practical focused on experimenting with polarisation it was developed with the development of key skills as a focus
- 2017–2019 **Frontiers in Physics Lectures**, *School of Physics and Astronomy*, University of Glasgow, UK.
- o Lectured on Imaging the Developing Zebrafish Heart as part of level 1 undergraduate physics course.
- 2016–2017 **Bioimage Analysis Lectures**, *School of Biological & Biomedical Sciences*, Durham University, UK.
- o Lectured on Bioimage Analysis as part of level 3/4 undergraduate course *Biological Imaging*
  - o Developed digital imaging & image analysis curriculum & content for multidisciplinary cohort
- 2015–2017 **Postgraduate CPD Series**, *School of Engineering & Computing Sciences*, Durham University, UK.
- o Developed a curriculum of CPD topics, e.g. delivering a conference talk, for the PhD cohort
  - o Delivered a seminar on the wide range of visualisation a plotting tools available to students

### Policy

- 2018 **Transparency of Evidence**, *Sense about Science*, UK.
- o A Spot Check of Government Policy Proposals July 2016 to July 2017
  - o The spotcheck scored “94 government policies [...] to assess how transparent they were about the evidence behind the policy. ”
  - o Contributed as a policy scorer of government policies
- 2018 **Member of Policy Sub-Committee**, *Royal Society of Biology in Scotland*, Scotland, UK.
- o Actively involved in the policy work of the RSB in Scotland
  - o Contributed to and edited collated responses to calls for evidence
  - o Involved in developing a database of routes into life science careers in Scotland

University of Glasgow – Glasgow, UK G12 8QQ

☎ +44 7891 077 729 • ✉ [chas.nelson@glasgow.ac.uk](mailto:chas.nelson@glasgow.ac.uk) • 🌐 [chasnelson.co.uk](http://chasnelson.co.uk)  
 in [ChasNelson1990](https://www.linkedin.com/company/ChasNelson1990) • 🐦 [@chas\\_nelson\\_](https://twitter.com/chas_nelson_) • 🐾 [DizzyHound](https://www.instagram.com/DizzyHound)  
 Blog: [The Little Eye](#) 📖

- 2016 **Strategy & Policy Intern**, *BBSRC*, Swindon, UK.
- Part of the Exploiting New Ways of Working science strategy group
  - Contributed to the BBSRC UK-wide direction & strategy for bioimaging and related technologies
  - Produced the public BBSRC Review of Bioimaging report
  - Developed quantitative & qualitative data analysis along with exciting visualisations
  - Delivered findings at high-profile meetings, e.g. with members of BIS, the UK governmental department in charge of science research funding
- 2012 **MURN Researcher**, *Matariki Undergraduate Research Network*, Durham, UK.
- Established a global research plan into interdisciplinary science in teaching & research
  - Produced an internal report for Durham University that has since been used for internal strategy
  - Collaborated with a global team including researchers from Australia and New Zealand
  - Undertook training in qualitative research & education research

### Outreach

- 2019 **Speaker**, *7 Minute of Science*, Glasgow, UK, *Revolutions in Modern Light Microscopy*.
- 2019 **Speaker**, *Café Scientifique Cockermouth*, Cockermouth, UK, *Revolutions in Light Microscopy*.
- 2019 **Speaker**, *University of the Third Age*, Glasgow, UK, *Revolutions in Modern Light Microscopy*.
- 2018 **Speaker**, *Café Scientifique Glasgow*, Glasgow, UK, *Revolutions in Light Microscopy*.
- 2018 **Speaker**, *Institute of Physics Scotland Public Lecture Series*, Glasgow, UK, *Imaging the Developing Heart: Combining Computing and Optics to Image and Quantify a Highly Dynamic System*.
- 2013 **Co-Founder**, *Durham City Café Scientifique*, Durham, UK.

### Other Experiences and Responsibilities

- 2017–current **Mental Health Awareness Events**, *School of Physics and Astronomy*, University of Glasgow, UK.
- Organised school-wide events for Mental Health Awareness Week 2018 including a poster campaign, coffee morning and a panel discussion from Mental Health First Aiders
  - Organised school-wide events for World Mental Health Day 2018 including a coffee morning and mental health colloquium
- 2015–2017 **Trustee**, *Ustinov College Graduate Common Room*, Durham, UK.
- Trustee of a registered charitable body (no. 1164865)
  - Part of Durham's historic listed collegiate system
  - Ensured charity carried out its purpose for the benefit of the college members
  - Complied with charity law and The Charity Commission
  - Ensured accountability of the charity and its executive board

## Awards, Grants & Honours

- 2019 Royal Society of Biology Outreach and Engagement Grant (£500)
- 2018–current EPSRC Doctoral Prize Research Fellowship
- Covers full salary with no research funds
- 2018 Glasgow Imaging Network 1<sup>st</sup> Prize Poster Award
- 2018 Institute of Physics Early Career Researchers Fund (£300)
- 2018 Honor Fell/Company of Biologists Travel Award (£500)
- 2018 EPSRC Vacation Scholarship (£2,300)
- Awarded funds to support an undergraduate student during a ten week summer project
- 2016 Wolfson Research Institute Small Grants Award (£2,000)
- 2015 1st prize Images of Technology @ Durham 2015
- 2014–2017 Biophysical Sciences Institute Junior Fellowship
- Awarded to researchers with significant experience in interdisciplinary life science research
- 2013 EPSRC PhD Studentship (3.5 years; £19,126 *per annum*)
- 2013 Institute for Advanced Computing Research Grant (£2,000)
- 2013 Honor Fell/Company of Biologists Travel Award
- Full registration and accommodation costs at the BSCB-BSDB Joint Spring Meeting 2013
- 2012 Matariki Undergraduate Research Network Research Grant (£2,000)

University of Glasgow – Glasgow, UK G12 8QQ

☎ +44 7891 077 729 • ✉ [chas.nelson@glasgow.ac.uk](mailto:chas.nelson@glasgow.ac.uk) • 🌐 [chasnelson.co.uk](http://chasnelson.co.uk)  
 in [ChasNelson1990](https://www.linkedin.com/company/chasnelson1990) • 🐦 [@chas\\_nelson\\_](https://twitter.com/chas_nelson_) • 🐾 [DizzyHound](https://www.instagram.com/dizzyhound)  
 Blog: [The Little Eye](https://www.thelittleeye.co.uk) 📖

---

## Publications

### Journal Articles

- 2019 Çiğdem Sazak, **Carl J. Nelson** & Boguslaw Obara. 'The multiscale bowler-hat transform for blood vessel enhancement in retinal images'. In: *Pattern Recognition* 88, pages 739–750. DOI: 10.1016/j.patcog.2018.10.011. arXiv: 1709.05097 [cs.CV].
- Joint first author. A top five computer vision journal (IF 3.962).
- 2019 Jonathan M. Taylor, **Carl J. Nelson**, Finnius A. Bruton, Aryan K. Baghbadrani, Charlotte Buckley, Carl S. Tucker, John J. Mullins & Martin A. Denvir. 'Hybrid optical gating for long-term 3D time-lapse imaging of the beating embryonic zebrafish heart'. In: *bioRxiv*. DOI: 10.1101/526830. bioRxiv: 526830.
- Submitted to Nature Methods (IF 26.919).
- 2017 Chris G. Willcocks, Philip T. G. Jackson, **Carl J. Nelson**, Amar V. Nasrulloh & Boguslaw Obara. 'Interactive GPU Active Contours for Segmenting Inhomogenous Objects'. In: *Journal of Real-Time Image Processing* (2017-12), pages 1–14. DOI: 10.1007/s11554-017-0740-1. DRO: 23575.
- 2017 Chris G. Willcocks, Philip T. G. Jackson, **Carl J. Nelson** & Boguslaw Obara. 'Extracting 3D Parametric Curves from 2D Images of Helical Objects'. In: *IEEE Transactions on Pattern Analysis and Machine Intelligence* 39.9 (2017-09), pages 1747–1769. DOI: 10.1109/TPAMI.2016.2613866. DRO: 19838.
- Highest ranked computer vision journal (IF 9.455).
- 2014 **Carl J. Nelson**, Patrick Duckney, Timothy J. Hawkins, Michael J. Deeks, P. Philippe Laissue, Patrick J. Hussey & Boguslaw Obara. 'Blobs and curves: object-based colocalisation for plant cells'. In: *Functional Plant Biology* 42 (2014-09), pages 471–485. DOI: 10.1071/FP14047. DRO: 24373.

### Peer-Review Conference Proceedings

- 2018 Shuaa S. Alharbi, Çiğdem Sazak, **Carl J. Nelson** & Boguslaw Obara. 'Curvilinear Structure Enhancement by Multiscale Top-Hat Tensor in 2D/3D Images'. In: *2018 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*. 2018-12, pages 814–822. DOI: 10.1109/BIBM.2018.8621329. arXiv: 1809.08678 [cs.CV].
- This proceeding was invited to be extended as a full journal article for Elsevier Methods. Note that computer science proceedings are blind peer-reviewed equivalently to journal articles.
- 2018 Çiğdem Sazak, **Carl J. Nelson** & Boguslaw Obara. 'The Multiscale Bowler-Hat Transform for Vessel Enhancement in 3D Biomedical Images'. In: *British Machine Vision Conference 2018*. 2018. arXiv: 1802.05097 [cs.CV].
- A top five computer vision conference. Note that computer science proceedings are blind peer-reviewed equivalently to journal articles.
- 2015 Philip T. G. Jackson, **Carl J. Nelson**, Jens Schiefele & Boguslaw Obara. 'Runway detection in High Resolution remote sensing data'. In: *2015 9th International Symposium on Image and Signal Processing and Analysis (ISPA)*. Zagreb, Croatia, 2015-09, pages 170–175. DOI: 10.1109/ISPA.2015.7306053. DRO: 16627.
- Note that computer science proceedings are blind peer-reviewed equivalently to journal articles.
- 2014 **Carl J. Nelson**, Martin Dixon, Pierre Philippe Laissue & Boguslaw Obara. 'Speeding up active mesh segmentation by local termination of nodes'. In: *Medical Image Understanding and Analysis*. London, UK, 2014-07. DRO: 15588.
- Note that computer science proceedings are blind peer-reviewed equivalently to journal articles. 'Speeding up active mesh segmentation by local termination of nodes'. In: *Medical Image Understanding and Analysis*. London, UK, 2014-07.

### Oral & Poster Presentations

University of Glasgow – Glasgow, UK G12 8QQ








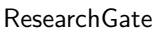
☎ +44 7891 077 729 • ✉ [chas.nelson@glasgow.ac.uk](mailto:chas.nelson@glasgow.ac.uk) • 🌐 [chasnelson.co.uk](http://chasnelson.co.uk)  
in [ChasNelson1990](#) • 🐦 [@chas\\_nelson\\_](#) • 🐾 [DizzyHound](#)  
Blog: [The Little Eye](#) 📖

- 2018 **Carl J. Nelson**, Charlotte Buckley, John J. Mullins, Martin A. Denvir & Jonathan Taylor. 'Imaging the developing heart: synchronized time-lapse microscopy during developmental changes'. In: *Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXV*. Volume 10499. 2018, pages 10499 - 10499 –6. DOI: 10.1117/12.2290191. arXiv: 1802.05663 [q-bio.TO].
- Proceedings. Presented at SPIE Photonics West 2018 BIOS (San Francisco, USA).
- 2018 **Carl J. Nelson**, Vytautas Zickus, Charlotte Buckley, Finn Bruton, Aryan Baghbadrani, John J. Mullins, Martin A. Denvir & Jonathan Taylor. 'Hybrid Optical Gating Allows 4D Imaging and Quantification in the Developing Zebrafish Heart'. In: *Frontiers in Bioimaging*. 2018.
- 2018 **Carl J. Nelson**, Vytautas Zickus, Charlotte Buckley, Finn Bruton, Aryan Baghbadrani, John J. Mullins, Martin A. Denvir & Jonathan Taylor. 'Hybrid Optically-Gated Light Sheet Microscopy Allows Long-term Timelapse Imaging in the Developing Zebrafish Heart'. In: *10th Anniversary Light Sheet Fluorescence Microscopy Conference*. Poster. Oral presented by last author. 2018.
- 2016 **Carl J. Nelson**, Chris G. Willcocks, Philip T. G. Jackson, P. Philippe Laissue & Boguslaw Obara. 'Application of High-Speed Level Set Segmentation to Light Sheet Fluorescence Microscopy'. In: *Light Sheet Fluorescence Microscopy Conference*. Presented by Boguslaw Obara. Sheffield, UK, 2016-09.
- 2014 **Carl J. Nelson**, Martin Dixon, Pierre Philippe Laissue & Boguslaw Obara. 'Speeding up active mesh segmentation by local termination of nodes'. In: *Medical Image Understanding and Analysis*. London, UK, 2014-07.
- 2014 **Carl J. Nelson** & Boguslaw Obara. 'A Bioimage Informatics QVEST: Quick, Versatile and Easy Segmentation & Tracking System'. In: *Society for Experimental Biology (SEB) Manchester 2014*. SEB. Manchester, UK, 2014-07. DRO: 16647.
- 2013 **Carl J. Nelson**, Tim J. Hawkins, Michael J. Deeks, Martin W. Goldberg, Roy A. Quinlan, Patrick J. Hussey & Boguslaw Obara. 'TANGL: Bioimage Informatics Tools for Analysis of 3D/4D Network Geometries for Life Sciences'. In: *Actin 2013. In absentia*. 2013-12.



## Professional Bodies

- 2018–current Member of the Sense about Science Voice of Young Science Network
- 2016–current Member of the Royal Society of Biology, MRSB
- Elected Ordinary Member of the Scotland Branch committee
- 2016–current Member of the Royal Microscopical Society
- 2016–current Associate Fellow of the Higher Education Academy
- 2011–current Member of Institute of Physics, MInstP

## Online Presence

- |   |  |   |  |
|---|--|---|--|
|  | <a href="https://www.chasnelson.co.uk">https://www.chasnelson.co.uk</a>                                  |  | @chas_nelson_  |
|  | The Little Eye:<br><a href="https://www.chasnelson.co.uk/thelittleeye">chasnelson.co.uk/thelittleeye</a> |  | DizzyHound   |
|  | <a href="https://www.chasnelson.co.uk/feed">chasnelson.co.uk/feed</a>                                    |  | ORCID 0000-0002-4114-1710                            |
|  | ChasNelson1990   |  | ResearcherID F-5524-2015<br>ResearchGate Chas_Nelson |

University of Glasgow – Glasgow, UK G12 8QQ

 +44 7891 077 729 •  [chas.nelson@glasgow.ac.uk](mailto:chas.nelson@glasgow.ac.uk) •  [chasnelson.co.uk](https://www.chasnelson.co.uk)  
 ChasNelson1990 •  @chas\_nelson\_ •  DizzyHound  
 Blog: [The Little Eye](https://www.thelittleeye.co.uk) 