AWARDEE REPORT FORM

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TWITTER HANDLE* *optional*	
UNIVERSITY	University of Bristol
NAME OF AWARD	**SYMINGTON BEQUEST FUND**

PURPOSE OF AWARD *conference/event attended/organised (full name) with city and dates.*

Attend the 14th European Congress for Stereology and Image Analysis (https://ecsia2025.karlin.mff.cuni.cz/) from 15th – 18th September 2025

REPORT: What were your anticipated benefits?

Minimum number of words between 200-400. Please write in coherent paragraphs.

Attending the 14th European Congress for Stereology & Image Analysis promised strong scientific gains across both methodology and application. The four plenaries alone mapped the cutting-edge: new inference for 3D particle size distributions from 2D sections, homogenization and localization in random media, data-driven stereology to reconstruct 3D microstructures from 2D imagery, and an ISSIA PhD prize talk applying rigorous stereological workflows to neurobiology. These talks were directly relevant to my interests in design-based stereology, quantitative microstructure analysis, and biomedical morphometrics. The minisymposia on “Image analysis and data-driven stochastic modelling with applications in materials science,” “Testing in spatial statistics,” and “Modelling and simulation of polycrystalline materials” offered concrete tools I could translate into my own pipelines: GAN-calibrated excursion-set models, adversarial Voronoi-based generators, physics-informed surrogates for mechanical fields, and robust nonparametric tests with FDR control. Exposure to these methods should sharpen my analysis of complex 3D architectures, improve uncertainty quantification, and accelerate simulation-informed structure–property studies. On the life-science side, contributed sessions intersected with my neurodegeneration and exercise-neuroscience agenda. Presenting our work on aerobic exercise, tau/amyloid, iron and oligodendrocyte ferroptosis in the aged rat hippocampus created opportunities for feedback on stereological endpoints, cell-interaction metrics, and multimodal image analysis—positioning the project for stronger translational framing and future grant applications.

Networking benefits were substantial: the ISSIA General Assembly, poster reception, and focused sessions concentrated leading groups from Ulm, Mines Paris PSL, Charles University, and others. These settings were ideal for initiating collaborations on (i) stereology-AI hybrids for 3D reconstruction from limited sections, (ii) rigorous testing frameworks for spatial point processes in biological tissues, and (iii) shared

datasets/workflows (e.g., StoManager1, CBCT/INR, FIB-SEM pipelines). Overall, the meeting was expected to deliver new methods, actionable contacts, and clear routes to enhance reproducibility, efficiency, and impact in my stereology-driven research.

COMMENTS: Describe your experience at the conference / lab visit / course / seminar/ event.
Minimum number of words between 200-400. Please write in coherent paragraphs.

ECSIA 2025 in Prague was an exceptionally well-run and energising meeting that balanced rigorous methods with real-world applications. From the outset, the programme signposted a clear arc: foundational stereological inference through to modern, data-driven pipelines. Plenaries such as Martina Vittorietti's treatment of Wicksell's legacy on inferring 3D size distributions from 2D sections set a high methodological bar and framed many hallway discussions about identifiability and model checking.

My own contributed talk on the hippocampus of aged, exercised rats (11:10–11:30) drew constructive questions on endpoint selection (e.g., aligning tau/amyloid measures with iron load and oligodendrocyte ferroptosis markers) and on integrating stereological counts with spatial statistics—feedback I will incorporate into our analysis plan and future grant framing. Presenting alongside colleagues working on quantitative neuroanatomy and spatial inference fostered a useful cross-pollination of ideas.

Two minisymposia stood out for immediate translational potential. The "Image analysis and data-driven stochastic modelling" sessions showcased adversarial microstructure generators, domain adaptation for segmentation, and Voronoi-based synthesis—all directly relevant to reconstructing 3D architecture from limited sections. Likewise, the "Testing in spatial statistics" stream provided practical toolkits—random-shift tests, robust non-parametric spatial regression, and FDR-controlled novelty detection—that I can apply to tissue point-pattern data and lesion mapping. The coherence of these sessions made it easy to see where classical design-based stereology dovetails with contemporary machine-learning-assisted models.

Community-wise, the atmosphere was collegial and focused. The ISSIA General Assembly helped clarify society priorities and opportunities for service, while coffee breaks and the conference dinner facilitated targeted networking with groups from Prague, Ulm, Mines Paris PSL and others—opening doors for data sharing and co-supervision. The local organisation was smooth (clear rooming, punctual sessions), which kept engagement high and discussions flowing between talks. Overall, the congress delivered exactly what one hopes for: sharper methods, critical feedback on ongoing work, and tangible collaborations that will improve the robustness and reach of my stereology-driven research.

In the general assembly I was also voted and confirmed to remain in the Board of the Society in recognition of my great experience and hight achievements in the field of Design-based Stereology over 30 years.

REPORT: In relation to skills, what were the most important things you gained? *(does not apply to equipment grant.* For public engagement/outreach awards what did your audience gain and how did you evaluate success?
Minimum number of words between 200-400. Please write in coherent paragraphs.

The most valuable gains were methodological and analytical. The minisymposium on image analysis and data-driven stochastic modelling sharpened my ability to combine design-based stereology with modern generative and domain-adaptation tools. I left with concrete strategies for synthesising and segmenting complex microstructures (e.g., GAN-calibrated excursion-set models, adversarial Voronoi generators, synthetic-to-real segmentation) that I can translate to 3D reconstructions from limited 2D sections in biomedical tissues. These sessions also clarified practical pitfalls and validation steps for model transfer, improving my confidence in building robust, reproducible pipelines.

Complementing this, the "Testing in spatial statistics" stream deepened my toolkit for inference on point patterns and spatial fields. Random-shift tests, robust non-parametric spatial regression, and FDR-controlled envelopes for hotspot detection provided immediately usable procedures for evaluating spatial hypotheses in tissue datasets. The conformal novelty-detection framework was particularly helpful for setting principled thresholds when scanning for rare pathologies, which I will apply to lesion mapping and cell-interaction analyses.

Presenting my contributed talk on exercise, tau/amyloid, iron and oligodendrocyte ferroptosis in aged rat hippocampus further developed my communication and study-design skills. Audience questions helped refine endpoint selection and how to integrate stereological counts with spatial statistics, which I have already incorporated into my analysis plan. The session also served as a live peer review of my graphical and statistical choices—making the work more rigorous and better aligned to translational narratives.

If viewed through an outreach lens, the audience benefited from a clear, stereology-first framing of complex neurodegeneration data and actionable examples of how to test spatial hypotheses without overfitting. I evaluated success via depth and specificity of Q&A, follow-up requests for slides and code snippets, and two concrete collaboration invites received after the session and during the ISSIA General Assembly. These tangible interactions—rooted in the programme's emphasis on reproducible, testable methods—are strong indicators that the skills I gained are relevant and immediately transferable to my research and teaching.

REPORT: How do you think you will put this learning experience into practice in the future? For public engagement/outreach awards how with the materials/knowledge generated by this activity be used in the future?

Minimum number of words between 200-400. Please write in coherent paragraphs.

I will translate the Prague learning into three concrete strands of practice: research pipelines, teaching/mentoring, and community/outreach. Methodologically, I will embed tools from the minisymposia directly into my quantitative image workflows: (i) use adversarial/Voronoi-based microstructure generators to create realistic 3D surrogates from limited 2D sections, improving power analyses and sensitivity testing; (ii) apply domain-adaptation strategies for "synthetic-to-real" segmentation so trained models generalise across staining or scanner shifts; and (iii) pilot GAN-calibrated excursion-set models where appropriate to capture morphology with uncertainty quantification. These will sit alongside my design-based stereology so that reconstructions remain unbiased yet more data-efficient. I will also adopt the spatial-testing toolbox (random-shift tests, robust non-parametric spatial regression, FDR envelopes, and conformal novelty detection) to formalise hypotheses on tissue organisation and lesion/hotspot detection in my neurobiology datasets.

Pedagogically, I will convert these advances into case-based labs for students: e.g., a practical comparing unbiased stereological estimates with ML-assisted segmentations on the same specimen, plus a mini-project where students implement an FDR-controlled hotspot analysis and defend their modelling choices. I will weave examples from the contributed and plenary sessions into lectures (e.g., inferring 3D particle size distributions from 2D, data-driven stereology) so learners see how classical estimators and modern generative/physics-informed models fit together. These activities will include sharable notebooks, clear validation checklists, and marking rubrics aligned to reproducibility and reporting standards.
Finally, for community impact, I will package reproducible templates (code, SOPs, and example datasets) to support collaborators met in Prague and use ISSIA channels to disseminate them. The ISSIA General Assembly also highlighted avenues to serve (e.g., society working groups), which I will pursue to help standardise analysis/teaching materials and lower barriers for newcomers. Near-term, I will re-analyse our hippocampal exercise dataset using the new spatial tests and segmentation transfer, document effect-size changes, and share results back to the network as a model of transparent and testable stereology.

Data Protection/GDPR: I consent to the data included in this submission being collected, processed and stored by the Anatomical Society. Answer YES or NO in the Box below

YES

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Not applicable.

SIGNATURE	Augusto Coppi	DATE	29-09-2025

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