BMIT eNews | Summer 2026

Current circulation: 400

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Dear BMIT User,

Things have been going fantastically at BMIT with C41 and the return of beam since we returned to normal operations at the start of 2026! It has been amazing seeing so many users, new and old, coming to the CLS to perform all kinds of different experiments. We are looking forward to the next half of the year and continuing to support our users' projects in the cycles to come. In this edition of the eNews we will cover some important updates to our live animal program, provide some information on the results of the cycle 42 call for proposals and the upcoming cycle 43 call for proposals, provide some updates to using the reconstruction server, and highlight some projects and works that have come out of our beamlines this past cycle.

Return and Updates to the Live Animal Program

With the BMIT beamlines back in full operation, the live animal program has also returned. As early as the start of cycle 42, we have had the pleasure to see the collaborative efforts of users, BMIT scientists, LASU staff, CLS HSE staff, veterinarian staff, and technicians all come together to work on these types of experiments.

Since it has been a while since our last live animal experiments were performed, we have taken some time to review the protocols and provide users planning for these types of experiments a step-by-step overview. As the preparation for live animal experiments at the BMIT beamlines involves several regulatory and administrative steps with significant lead times, the following table can be used to obtain an approximate timeline:

Step	Approximate Lead Time	Notes
Apply for beamtime at BMIT	~3 months	In the initial proposal submission, include all animal protocols and ethics of home institution in the User Portal. From proposal submission deadline to results announced
Schedule a preliminary meeting	Schedule as soon as possible, at least 6 months before the experiment, even before beamtime has been scheduled/awarded	This is a meeting between the users, BMIT scientists, CLS Health and Safety Environment (HSE), Director of Animal Ethics Research from the University, and Animal Care Manager from LASU
Apply for University of Saskatchewan (USask) Animal Use Protocol (AUP)	~2 months	Must be approved before ordering animals or accessing LASU
Apply for controlled substances exemption (if needed)	~2 months	Needs a local faculty or beamline scientist sponsor
Billing / CFOAPAL setup	A few weeks	Arrange with LASU and USask Financial Services before arrival
Initiate an NSID for outside users	Can be initiated before ethics application or at the time of the application submission	The ACRS office will be the ones to do this. Contact UACC.office@usask.ca
Complete University Animal Care Committee (UACC) ethics training	~1 day	This can be done online and is mandatory for all users
Check whether additional training is required to work on campus	Self-paced	Contact LASU Biosafety officer
Practical skills workshops (on-site)	Batched on arrival	Equivalency/competency may be granted by LASU based on prior training
Lab Animal Services Unit (LASU) facility orientation (on-site)	~1 day	Mandatory to obtain key fob to access LASU
Animal ordering	~10 days	Order cutoff is Monday at 1:00 PM for delivery the following week
Surgical suite access	After full training	Pre-booking available through LASU

For more information on the live animal program and preparing for experiments, please contact BMIT staff.

Cycle 42 Call for Proposals Results

We received 33 new proposals and 28 beamtime requests against active proposals for a total of 66 proposals. The peer-review process has been completed, and allocation of the proposals has gone out to users who have been awarded beamtime. We look forward to supporting your projects, and our scientists will reach out to investigators, spokespersons, and delegates for the current cycle closer to your scheduled beamtime for support. Your BMIT *Primary Point of Contact* for your experiment will contact you several weeks before the scheduled beamtime to confirm the details regarding samples, detectors, and training.

Cycle 43 Call for Proposals Opens July 22, 2026

The cycle 43 call for proposals opens July 22, 2026! For full information on the upcoming cycle and how to apply for beamtime, please visit:

https://www.lightsource.ca/users/getting-started/applying-for-beamtime.php

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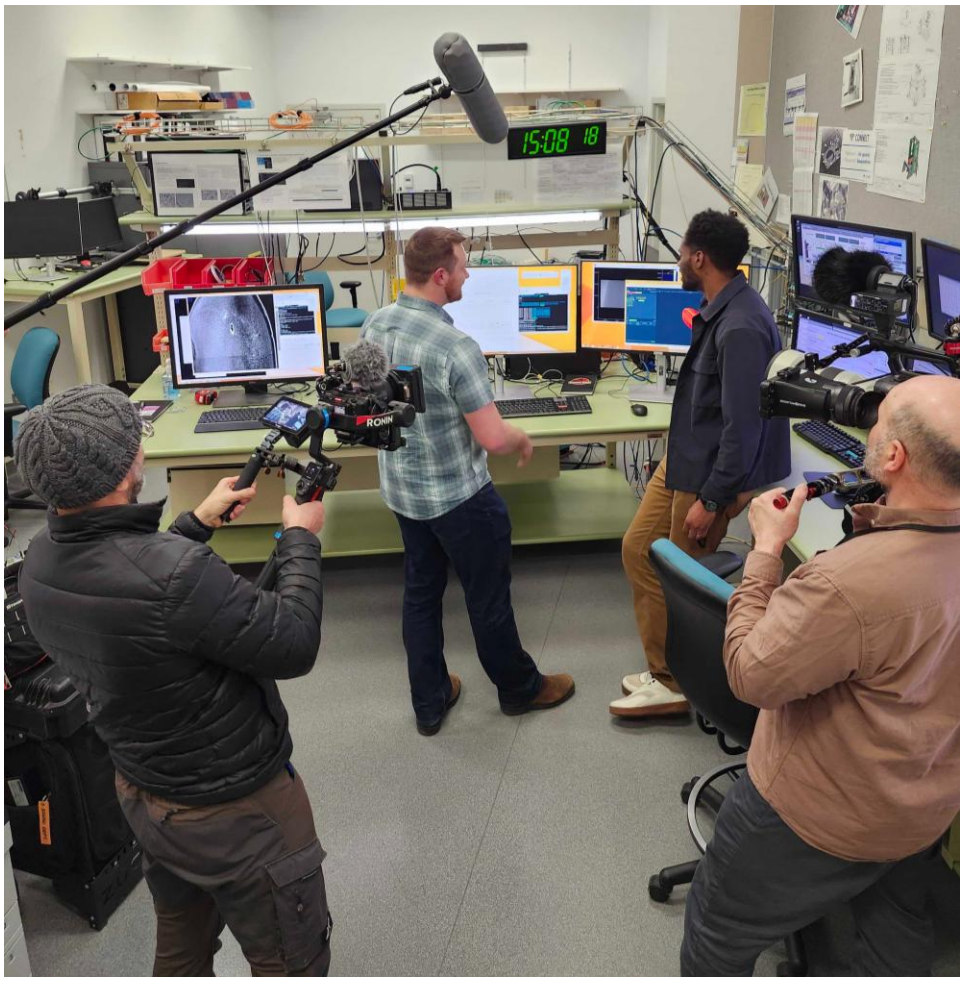
Around the Beamlines

We were very fortunate this past cycle to work with the amazingly talented Ari A. Cohen, Luc Robida, and Anthony Morgan as they followed one of our user groups who are studying baby dinosaurs! We can’t wait to see the documentary on CBS/Radio-Canada, PBS, and other around the world! Read more about Rotating Planet Productions and The Incredible World of Ancient Baby Beasts here.



Pictured. Luc Robida (Cameraman), Greg Funston (Paleontologist), Anthony Morgan (Co-Host of *The Nature of Things*), Ari A. Cohen (Producer)

BMIT User Data Back-up Policy

BMIT's data retention policy at present is - a period of 2 cycles or 1 year plus the current cycle for any "raw" data, and 90 days for any files created by users in their "rec" folders. The CLS has set up a new server using Globus to better link users to projects that they are affiliated with and can now access their data directly, eliminating the need to perform mass copying of projects when users need to retrieve their data. Users can find a personal download for Globus at https://www.globus.org/globus-connect-personal, and once setup, will receive an email from the Globus server to access their data.

Please note that at no point will we back-up reconstructed and processed data - this is the sole responsibility of the research groups. At the end of this retention period, data will be evaluated for its ongoing value and relevance. If data is deemed no longer necessary, it will be securely disposed of following data sanitization procedures. If you

require a copy of your data, please contact the BMIT scientist that helped you with your experiment.

Remote Access for microCT Data Reconstruction and Visualization Server

It has been great to see an influx of users requesting time on our reconstruction servers to process the data that has been collected over this past cycle. With access to the high-performance computing (HPC) cluster, reconstruction and analysis have been much faster for many users. However, there have been a few challenges in allowing users to access this system.

Uncapped access to HPC was resulting in the system being backed up with requests that didn't use anywhere near the number of resources that were being reserved when running on a node. This was primarily from the way that reconstruction jobs were handled, with the default number of resources often being much higher than what would realistically be required to perform the task. There was also an issue with the number of tasks that users could send, allowing for more than one instance of the reconstruction software to be opened and filling up the queue with several tasks from the same user. Both issues could very quickly occupy most of the resources on HPC, producing a large delay in data processing.

To resolve this issue, the default number of resources that are requested when logging onto HPC has been lowered substantially. This should have no noticeable impact on users' reconstructions as the number of resources is far more reasonable, with the benefit of allowing more users to use HPC! Users are also limited to one instance on HPC to reduce the impact of filling up the task queue.

A comprehensive guide for what to do after your beamtime can be found at:

https://bmit.lightsource.ca/user-guide/after-beamtime/

Please contact Xiao Fan Ding (XiaoFan.Ding@lightsource.ca) for details and scheduling. Depending on the number of requests, the duration of access may be limited to 2-3 days. If it is anticipated that your datasets require more resources to process than usual, please contact the beamline scientist that supported your project.

Pictures of the Season

In Vivo Imaging of Central Nervous System Fluid Spaces Using Synchrotron Radiation-Based Micro Computed Tomography

Contact Information: Vartan Kurtcuoglu, University of Zurich
Reference: Girona Alarcón, M., Kuo, W., Humbel, M., Tanner, C., Fardin, L., Bausch, B., Decker, Y., Spera, I., Rodgers, G., Deyhle, H., Bravin, A., Hoshino, M., Panahifar, A., Uesugi, K., Gasilov, S., Pleskač, P., Zhang, Y., de Zélicourt, D., Brenna, A., … Kurtcuoglu, V. (2026). In vivo imaging of central nervous system fluid spaces using synchrotron radiation-based micro computed tomography. *Nature Communications*. https://doi.org/10.1038/s41467-026-71835-9

Current intravital imaging techniques for the mouse central nervous system (CNS) do not simultaneously provide micrometer-scale spatial resolution, whole-brain coverage, and sub-minute temporal resolution, limiting organ-wide interrogation of CNS fluid dynamics in vivo. Here, we introduce intravital synchrotron radiation-based hard X-ray micro computed tomography (SRμCT), a modality that enables dynamic whole-brain imaging at micrometer-scale spatial resolution in living mice. We performed intravital SRμCT of mouse CNS fluid spaces at three synchrotron radiation facilities, imaging both anesthetized free-breathing and mechanically ventilated animals, with and without retrospective cardiac gating. This approach achieves complete brain coverage with temporal resolution of up to 23 s and voxel sizes down to 6.3 μm, at an effective spatial resolution better than 20 μm, enabling time-resolved visualization of cerebrospinal fluid (CSF) contrast distribution and quantitative analysis of tissue motion across the entire brain. By combining micrometer-scale resolution, whole-organ field of view, and dynamic intravital imaging, SRμCT closes a long-standing methodological gap between optical microscopy and magnetic resonance imaging. Intravital SRμCT provides access to spatiotemporal information that cannot be obtained with existing techniques and establishes a framework for testing and integrating mechanistic models of CSF dynamics and solute transport at the scale of the whole brain.

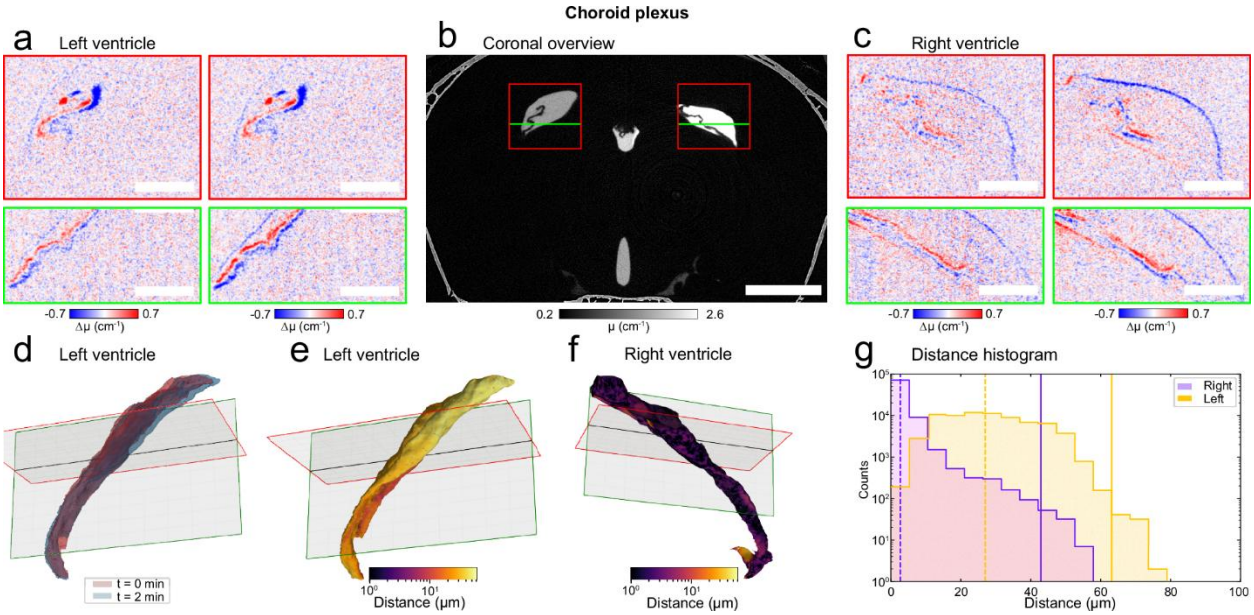


Figure. Non-periodic choroid plexus (ChP) motion acquired at BMIT (n = 1, Subject_ID: CA019): a, Subtraction images to inspect ChP movement between two acquisition time points in the left framed region (top row) and green section (bottom) in i. Difference between time points: 1 min (left column) and 2 min (right). Red values indicate an increase in attenuation coefficient in time, blue a decrease. Scale bars: 0.5 mm. b, Coronal plane with left lateral ventricle (left red frame) and right lateral ventricle (right red frame) marked for analysis in a and c. Green lines indicate horizontal section planes also used in those panels. Scale bar: 2 mm. c, Subtraction image as in a, but for the right lateral ventricle. d, Rendering of segmented left lateral ChP, acquisitions at two separate time points, 2 min apart. The red- and green-bordered planes correspond to those in a-c. e, Distance map between ChP at two time points as shown in d. Note the log- scaling of the colors. f, ChP distance map as in e, but for the right lateral ventricle. g, Histogram of distances shown in e, f, 21 bins in a range of [0 100] μm. Purple and yellow curves represent right and left lateral ventricular ChP, respectively. The dotted vertical lines indicate, for the respective lateral ventricle, median values (right: 3 μm, left: 27 μm), while the solid vertical lines mark the 99.9 percentile limits (right: 43 μm, left: 63 μm). Note the log-scaling of the vertical axis.

Assessing the Accumulation of Microplastics in Earthworms (Eisenia Fetida) Using Traditional Bioaccumulation Modeling and Synchrotron-Based Microcomputed Tomography

Contact Information: Ryan Prosser, University of Guelph
Reference: Letwin, N. V., Stobbs, J. A., Princz, J., Stephenson, G. L., Gillespie, A. W., Ijzerman, M. M., & Prosser, R. S. (2026). Assessing the accumulation of microplastics in earthworms (Eisenia fetida) using traditional bioaccumulation modeling and synchrotron-based microcomputed tomography. Environmental Toxicology and Chemistry. https://doi.org/10.1093/etojnl/vgag072

Microplastics (MPs) are recognized as a ubiquitous contaminant in terrestrial ecosystems. Earthworms, which play key roles in soil structure, nutrient cycling, and ecosystem function, are important bioindicators for assessing MP exposure and fate. However, uncertainties remain regarding MP toxicokinetics in earthworms, including ingestion dynamics, retention, and the potential for translocation across the gut epithelium. This study investigated the movement and fate of MPs in Eisenia fetida by quantifying uptake and elimination across five common MP morphologies (films, fibers, foams, fragments, and spheres) and by using synchrotron-based microcomputed tomography (SR-μCT) to visualize internal distributions of 5 to 22 μm glass microspheres and 45 to 53 μm polyethylene microspheres. Across 21-day exposure and depuration phases, earthworms rapidly ingested all MP morphologies, reaching steady state before Day 10 for most types, and efficiently eliminated MPs once removed from spiked soils. Elimination rate constants (1.27–2.34 day−1) corresponded to short half-lives (<1 day), and bioaccumulation factors were consistently low (0.023–0.058), indicating limited retention relative to soil concentrations. The SR-μCT imaging provided high-resolution 3D confirmation that MPs remained entirely confined to the gastrointestinal tract, with none of the 2,779 detected particles ranging from 5 to 53 μm crossing the gut epithelium. Despite higher MP densities in earthworms exposed to smaller glass microspheres, this pattern reflected differences in ingestion rather than tissue penetration. Reduced gut-to-worm volume ratios in polyethylene-exposed worms suggested decreased feeding or avoidance behavior toward the polyethylene microspheres. Overall, these results demonstrate that E. fetida rapidly ingest and eliminate MPs without tissue translocation, and that their gut contents provide a reliable short-term snapshot of MP availability in soil.

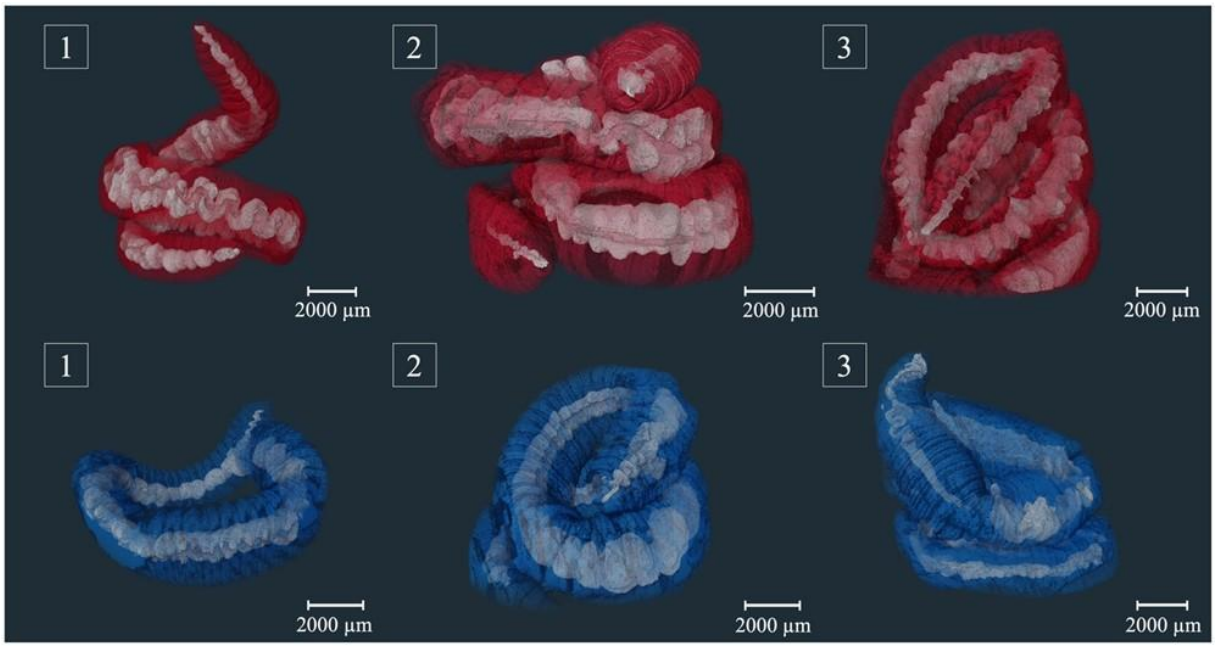


Figure. Three-dimensional reconstructions of six earthworms. Tissue shown in white represents the gastrointestinal (GI) tract. Models on top row indicate earthworms exposed to barium titanate glass microspheres (5–22 µm), whereas models on bottom row represent earthworms exposed to barium sulfate polyethylene microspheres (45–53 µm).

New Publications

Publications are an important factor in our funding and taken into consideration by the peer review committee. Users are encouraged to add their publications to the CLS database. Please review the publications list and ensure that all of your publications are included:

http://bmit.lightsource.ca/publications

To add new or missing publications to the CLS database use the CLS User Portal System:

https://user-portal.lightsource.ca

After you log in, click on 'Publications', then 'All Publications', then simply click on the **green + icon** in the top right corner to add your publication. Papers are easily added using the DOI.

Acknowledgements

All Users and CLS Staff are required to acknowledge the work they performed, in whole or in part, at the Canadian Light Source. Authors are requested to include the following Acknowledgement when submitting or presenting results from the CLS:

"Part or all of the research described in this paper was performed at the Canadian Light Source, a national research facility of the University of Saskatchewan, which is supported by the Canada Foundation for Innovation (CFI), the Natural Sciences and Engineering Research Council (NSERC), the National Research Council (NRC), the Canadian Institutes of Health Research (CIHR), the Government of Saskatchewan, and the University of Saskatchewan."

Acknowledgement of any beamline staff who may have assisted in optimization and preparation of the experimental setup as well as data acquisition or data processing is very welcomed.

Moreover, if users would like to refer to technical specifications of BMIT beamlines, they may cite the following articles:

- To refer to technical specifications of the BMIT-BM beamline (i.e., 05B1-1 POE-2 endstation):

Wysokinski, T. Chapman, D. Adams, G., Renier, M. Suortti, P. Thomlinson, W. Beamlines of the biomedical imaging and therapy facility at the Canadian Light SourcePart 1. Nuclear Instruments and Methods in Physics Research A, vol. 582, iss. 1 pp. 73-76, 2007.

- To refer to technical specifications of the BMIT-ID beamline (i.e., 05ID2 SOE-1 endstation):

Wysokinski, T. Chapman, D. Adams, G., Renier, M. Suortti, P. Thomlinson, W. Beamlines of the biomedical imaging and therapy facility at the Canadian Light SourcePart 3. Nuclear Instruments and Methods in Physics Research A, vol. 775, iss. 1 pp. 1-4, 2015.

- To cite the UFO-KIT reconstruction software you may cite:

Vogelgesang, M.; Farago, T.; Morgeneyer, T. F.; Helfen, L.; dos Santos Rolo, T.; Myagotin, A.; Baumbach, T. Real-time image-content-based beamline control for smart 4D X-ray imaging. Journal of synchrotron radiation, Vol. 23, iss. 5, pp. 1254-1263. 2016.

Reported Publications using BMIT Beamlines – January to June 2026

1. Agrawal, Sumit K.; Li, Hao; Spedaliere, Carmine; Rask-Andersen, Helge; Ladak, Hanif M. et al. (2026). *The cochlear morphometry compendium: High-resolution synchrotron measurements and normative reference values*. Journal of Anatomy . 10.1111/joa.70175.

2. Arash Jamalabadi (2026). *Health and Safety Profiling of Micronutrients and Heavy Metals in Black Rice Diversity Panel*. Supervisor: Butardo Jr, Vito; Hocking, Rosalie. Victoria, Australia: Swinburne University of Technology. https://doi.org/10.25916/sut.32152143.

3. Arnemo, Jon M.; Leontowich, Adam F. G.; Fuchs, Boris; Hydeskov, Helle B.; Rodushkin, Ilia et al. (2026). *Toxic food: commercial bear meat products are highly contaminated with lead (Pb) from hunting ammunition*. Exposure and Health 18(2) . 10.1007/s12403-026-00752-5.

4. Dmytruk, Spencer; Doan, Huu; Shoker, Ahmed; Abdelrasoul, Amira (2026). *WCN26-6970 IN SITU SYNCHROTRON RADIATION MICRO-COMPUTED TOMOGRAPHY IMAGING TO EXPLORE INDOXYL SULFATE-INDUCED EFFECTS ON PROTEIN ADSORPTION WITHIN HEMODIALYSIS MEMBRANES*. Kidney International Reports 11(4) , 105306. 10.1016/j.ekir.2026.105306.

5. Dmytruk, Spencer; Shoker, Ahmed; Abdelrasoul, Amira (2026). *WCN26-6984 INVESTIGATING THE EFFECTS OF P-CRESYL SULFATE (P-CS) ON HUMAN SERUM ALBUMIN ADSORPTION DYNAMICS WITHIN POLYETHERSULFONE DIALYSIS MEMBRANES USING IN SITU SYNCHROTRON IMAGING*. Kidney International Reports 11(4) , 105307. 10.1016/j.ekir.2026.105307.

6. Farsi, Aida; Batta, Vasant; Tugirumubano, Alexandre; Seip, Tess; Bazylak, Aimy et al. (2026). *Impact of over compressing gas diffusion electrodes in alkaline zero-gap CO2 electrolyzers*. Scientific Reports . 10.1038/s41598-026-42959-1.

7. Giese, Dina (2026). *Further Analyses of the Human Temporal Bone Based on Micro-CT and Synchrotron Radiation Phase-Contrast Imaging*. Supervisor: Li, Hao. Uppland, Sweden: Uppsala University. https://www.diva-portal.org/smash/record.jsf?pid=diva2%3A2051130&dswid=4652.

8. Girona Alarcón, Marta; Kuo, Willy; Humbel, Mattia; Tanner, Christine; Fardin, Luca et al. (2026). *In vivo imaging of central nervous system fluid spaces using synchrotron radiation-based micro computed tomography*. Nature Communications . 10.1038/s41467-026-71835-9.

9. Kalugin, Denis; Thool, Prajwal; Blocka, Carter; Zhu, Ning; Mao, Chen et al. (2026). *Understanding real-time water penetration dynamics in tablets using synchrotron X-ray micro-computed tomography*. Journal of Pharmaceutical Sciences , 104226. 10.1016/j.xphs.2026.104226.

10. Kamal, Nahid S.; Acheampong, Samuel; Zaman, Rokon Uz; Strasinger, Caroline; Clark, Andrew G. et al. (2026). *Technical challenges and quality considerations for dissolving microneedles*. International Journal of Pharmaceutics , 126830. 10.1016/j.ijpharm.2026.126830.

11. Letwin, Nicholas (2026). *Microplastic Contamination of Terrestrial Environments: Biosolids, Agricultural Soils, and Effects on Earthworms*. Supervisor: Prosser, Ryan. Ontario, Canada: University of Guelph. https://atrium.lib.uoguelph.ca/items/85f61996-1e7a-4cb2-b30a-6067abda439c.

12. Letwin, Nicholas V; Stobbs, Jarvis A; Princz, Juliska; Stephenson, Gladys L; Gillespie, Adam W et al. (2026). *Assessing the Accumulation of Microplastics in Earthworms (Eisenia fetida) Using Traditional Bioaccumulation Modeling and Synchrotron-Based Microcomputed Tomography*. Environmental Toxicology and Chemistry . 10.1093/etojnl/vgag072.

13. Merkowsky, Kaitlin; Kirychuk, Shelley; Aulakh, Gurpreet K.; Thompson, Brooke; Pandher, Upkardeep S. et al. (2026). *Lung inflammation after repeated exposure to LPS and glyphosate in female mice*. Scientific Reports . 10.1038/s41598-026-58018-8.

14. Montanha, Gabriel Sgarbiero; Perez, Lucas Coan; Lepri, Andrea; Longo, Chiara; Marzi, Davide et al. (2026). *Protein Biosynthesis Is Associated with Ionome Composition in Soybean Seeds*. ACS Agricultural Science and Technology . 10.1021/acsagscitech.5c01032.

15. Murray, Alison M.; Brinkman, Donald B.; Scrøder, Ane Elise; Newbrey, Michael G.; Van Loon, Lisa L. et al. (2026). *Early diversity of acanthomorph fishes in fresh waters of the Late Cretaceous*. Canadian Journal of Zoology 104, 1-18. 10.1139/cjz-2025-0127.

16. Rhoades, Glendon; Chapman, L. Dean (2026). *A double-crystal bent Laue parallel-beam compressor*. Journal of Synchrotron Radiation 33(2) . 10.1107/s1600577525009609.

17. Shakourifar, N.; Rohani, S. A.; Agrawal, S.; Ladak, H. M. (2026). *Synchrotron radiation phase-contrast imaging enables finite element modeling of the cochlea*. None. , 75 10.1117/12.3081946.

18. Syeda, Hira; Bahig, Jumanah; Shoker, Ahmed; Sakharkar, Meena Kishore; Abdelrasoul, Amira et al. (2026). *Exploratory study of dialysis membrane impact on epigenetic methylation patterns in hemodialysis patients using genomic and synchrotron investigations*. Scientific Reports . 10.1038/s41598-026-45183-z.

19. Thomsen, Lisbeth Koch; Laursen, Kaja Søndergaard; Sikjær, Tanja; Thomsen, Jesper Skovhus; Andreasen, Christina Møller et al. (2026). *Intratrabecular bone remodeling – a previously overlooked mode of remodeling hyperactivated by parathyroid hormone*. Journal of Bone and Mineral Research . 10.1093/jbmr/zjag081.

20. Wei, Jing; Tan, Lichao; Ma, Qianyi; Long, Xintao; Li, Shibin et al. (2026). *Achieving Ah-Level Zn–MnO2 Pouch Cells via Interfacial Solvation Structure Engineering*. Nano-Micro Letters 18(1) . 10.1007/s40820-025-01935-6.

21. Yin, Runrong; Martinez Soberanes, Edgar E.; Zhang, Wenjun; Reaney, Martin J.T. (2026). *Mechanistic analysis of fracture-controlled canola dehulling via finite element modeling*. Current Research in Food Science 12, 101301. 10.1016/j.crfs.2026.101301.

22. Zhao, Weinan; Wang, Yi; Mashhadimoslem, Hossein; Zhu, Ning; Karimi, Peyman et al. (2026). *Cluster level entropy enhancement in neutral acetate electrolytes enables economical and durable zinc air batteries*. Nature Communications 17(1) . 10.1038/s41467-025-65366-y.

https://bmit.lightsource.ca/