Sydney Radiative Cooling Workshop 2025

Book of Abstracts

October 2 – October 3, 2025

Sydney Nano Hub

The University of Sydney, Sydney, Australia

Acknowledgements

This workshop was made possible through generous funding by the University of Sydney's Physics Foundation under the Grand Challenge Scheme. Professor Shanhui Fan's visit was funded by the Peter Domachuk Memorial Fund.

Organising committee

- Boris Kuhlmey, co-chair *(The University of Sydney)*
- Alex Song, co-chair *(The University of Sydney)*
- Ned Ekins-Daukes *(University of New South Wales)*
- Michael Nielsen *(University of New South Wales)*

With assistance from Jadon Lin, Xiong Yinxiang, Xie Wei, Hu Yecheng, Rong Liheng and Ming Gao.

Abstract booklet edited by Jadon Lin.

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Sydney Radiative Cooling Workshop 2025

DAY 1

KEYNOTE SESSION

Thermal radiation beyond thermal equilibrium

*Shanhui Fan**

Stanford University

***Presenting author:** *Shanhui Fan (shanhui@stanford.edu)*

We consider thermal radiation from systems out of thermal equilibrium. In particular, we consider the implications of photon chemical potentials on thermal radiation. We also discuss novel thermal physics as enabled by time modulation.

URBAN OVERHEATING AND BUILDING PERFORMANCE

Urban Overheating – Developments- Impacts and Heat Mitigation Progress

*Mat Santamouris**

University of New South Wales, Australia

***Presenting author:** *Mat Santamouris (m.santamouris@unsw.edu.au)*

Overheating of the Built Environment is the most documented phenomenon of climate change impacting the human life in many ways. There are more than 13,000 cities exhibiting serious problems of higher urban temperatures in the world. The magnitude of overheating depends strongly on the local climatic and local landscape conditions. The magnitude of the urban overheating may be as high as 11°C in some cities, and it gets its maximum during anticyclonic weather conditions while the landscape, land use and the morphological and construction characteristics of cities influence highly the magnitude of overheating.

This lecture will present the most recent developments on the magnitude and the characteristics of the urban overheating and the potential synergies with the global climatic change. It will analyse the latest qualitative and quantitative data on the impact of higher urban temperatures on the building's energy supply and demand, heat related mortality, morbidity and wellbeing, human productivity, survivability of low-income population and environmental quality of cities. The impact of the actual urban overheating as well as of the expected future increase of the urban temperature, on the energy consumption of buildings and their environmental quality is quantified and analysed. The challenges around the dramatic increase of the cooling energy demand in the developing countries and the corresponding impact on environment and economy will be discussed. Proper adaptation techniques aiming to respond to the overheating challenge, decrease the energy consumption of buildings, improve environmental quality and produce added value to the local economies are analysed.

Finally, it will present the main future challenges related to urban overheating and proposes a specific agenda to alleviate and counterbalance its impact on human life.

Towards All-year Performance of Radiative Cooling Materials

*Riccardo Paolini**

University of New South Wales, Australia

***Presenting author:** *Riccardo Paolini (r.paolini@unsw.edu.au)*

Daytime Radiative Coolers can minimise building energy consumption for cooling and mitigate urban overheating. However, substantial overcooling during winter and durability issues may limit the benefits when considering the annual balance. Here, we investigate latent and sensible energy storage to overcome the issue and describe the effects on condensation and frost formation. We also discuss the limitations of current outdoor measurement approaches.

Materials Solutions for a Cool and Sustainable City

*Xiaobo Yin**

The University of Hong Kong

***Presenting author:** *Xiaobo Yin (xbyin@hku.hk)*

Micro/nanostructured materials offer new opportunities for high-efficiency devices and systems at the nexus of energy, water, and food. Fundamental understanding at the small scale enables us to design structures and materials with unprecedented performances. However, there is a tremendous gap between the proof-of-principle demonstration at small scale and the intrinsically large scale real-world thermal and energy systems. As one example, energy use for cooling and air conditioning is poised to increase dramatically over the next several decades driven by population, climate and economics. In this talk, I will give an overview on our research progress and, more specifically, present our recent development on thermal radiation control for large scale radiative cooling applications. We demonstrated the scalable manufactured micro-optical composites with extreme light-material interaction provides a 24/7 continuous cooling power of 110 W/m2 at no additional cost for electricity nor water. We show how a laboratory setup can precisely reproduce the standard atmosphere conditions and allows accurate calibration of all radiative cooling materials.

Radiative Cooling Before It Was Cool: Two Decades of Passive Thermal Control

*Angus Gentle**

School of Photovoltaic and Renewable Energy Engineering, University of New South Wales, Australia

***Presenting author:** *Angus Gentle (a.gentle@unsw.edu.au)*

Spectral Thermal Control (STC)—the manipulation of surface spectral properties to regulate heat flow—offers a powerful route to passive cooling in buildings, photovoltaics, and water systems. In this talk, I present a historical perspective linking radiative cooling with the broader field of STC, tracing research from the early 2000s to the present. Early work on coloured paints, infrared-reflective pigments, and IR-selective windows showed that visually appealing surfaces can significantly reduce solar heating. This was followed by advances in cool roof coatings, polymer films, and nanophotonic surfaces capable of achieving sub-ambient temperatures both at night and under direct sunlight. Importantly, I will emphasize the need to evaluate the total system thermal balance, rather than focusing solely on spectral properties. Through two decades of research, I will show how spectral engineering, material selection, and system-level design can maximize STC performance, providing both practical energy savings and a roadmap for next-generation passive thermal management.

COATINGS FOR BUILDING ENVELOPES

Thermochromic Coatings - Dynamic Radiative Cooling Strategies for Energy-Efficient Buildings

Xiaolin Wang[1], Yuxuan Zhang[2], Xiaoqiang Zhai[2]*

[1]*Australian National University, Australia*

[2]*Shanghai Jiao Tong University*

***Presenting author:** *Xiaolin Wang (xiaolin.wang@anu.edu.au)*

The rapid growth in global cooling demand poses a major challenge to achieving net-zero energy goals in the built environment. Conventional building envelopes are typically static, offering limited adaptability to seasonal and diurnal variations in climate. This presentation explores the emerging potential of thermochromic coatings as dynamic radiative cooling strategies for energy-efficient buildings. Radiative cooling materials achieve sub-ambient temperature regulation by combining strong solar reflectance with high mid-infrared emittance, but their static nature can lead to undesired heat loss in cooler conditions. Conversely, thermochromic coatings provide temperature-dependent control of solar transmittance and reflectance. This talk will introduce a comparative analysis against common and cool coatings, which demonstrates that thermochromic coatings achieve lower surface temperatures than common coatings in summer and higher surface temperatures than cool coatings in winter, thereby avoiding the heating penalty of cool coatings.

Fire-safe all-day passive radiative cooling coating for sustainable buildings

*Pingan Song**

University of Southern Queensland, Australia

***Presenting author:** *Pingan Song (pingan.song@usq.edu.au)*

Passive radiative cooling (PRC) coatings play a significant role in reducing energy consumption by cooling buildings. Unfortunately, due to the lack of an integrated design, most existing PRC coatings are susceptible to UV aging and rain, and fail to resist aperiodic fire attacks, restricting their practical applications for buildings in the wildland-urban interface (WUI). To fill this research gap, we here propose an integrated composition design strategy to develop a scalable, durable and fire-safe PRC coating comprising of a molecularly engineered fire-retardant copolymer adhesive, hollow glass microspheres (HGMs), and boron oxide (B2O3). Besides intrinsic fire retardancy, the copolymer endows the coating with a strong adhesion to diverse

substrates. HGMs enable the coating to show good thermal insulation and a high solar reflectance (>94%), and B2O3 promotes the in-situ formation of a robust non-combustible ceramic char layer in fires. The coating achieves an unparalleled fire resistance (UL-94 V-0 rating, LOI: 88.5 vol.%), a high mid-infrared emissivity (>95%) for efficient heat dissipation, and exceptional durability against UV-aging and rain. The performance integration makes as-developed PRC coatings outperform most existing PRC counterparts. This work offers an integrated design solution to developing fire-safe PRC coatings towards safe and sustainable buildings.

Sustainable photothermal management

Baohua Jia, Han Lin, Keng-Te Lin*

[1]*Centre for Atomaterials and Nanomanufacturing, RMIT University*

***Presenting author:** *Baohua Jia (baohua.jia@rmit.edu.au)*

The urgent demand for sustainable energy solutions requires innovative approaches to both energy harvesting and thermal management. This talk presents cutting-edge advancements in photothermal management technologies that enable more efficient energy conversion and utilization by precisely controlling light absorption and thermal radiation. Two complementary nanophotonic strategies will be discussed: graphene-based perfect absorbers for solar-thermal energy harvesting and selective radiative coolers for passive heat dissipation. Graphene, with its unique optical and thermal properties, offers a versatile platform for designing perfect absorbers with near-unity solar absorption and broad spectral tunability. By coupling graphene with photonic resonators and engineered substrates, we demonstrate metastructures that achieve spectrally selective absorption, minimal thermal emission, and high photothermal conversion efficiency-ideal for applications in photothermal catalysis, water desalination, and thermophotovoltaics. On the other hand, selective radiative coolers operate by exploiting the atmospheric transparency window (8-13 μm) to reject heat to outer space while reflecting solar radiation. Through precise material selection and nanostructure engineering, we show how these systems can achieve sub-ambient cooling even under direct sunlight. Integration of these coolers with energy systems can dramatically reduce energy losses and enhance the overall efficiency of solar and electronic devices. Together, these technologies illustrate the power of photonic material design in addressing global energy challenges. This talk will bridge fundamental concepts in light–matter interaction with practical demonstrations, supported by experimental and simulation results, offering new perspectives on how nanophotonics can drive the future of sustainable energy.

PERSONAL COOLING & ENABLING PHOTONICS FOR PRC

Passive cooling textiles

*Alex Y. Song**

The University of Sydney, Australia

***Presenting author:** *Alex Y. Song (alex.song@sydney.edu.au)*

Passive cooling textiles use nanostructures to reflect sunlight and emit body heat through the atmospheric window, enabling cooling without electricity. Such fabrics can reduce skin temperature by several degrees in both indoor and outdoor environments, offering relief in hot conditions. Applications range from personal clothing to medical wear and protective gear, as well as large-scale uses on rooftops and canopies to reduce building energy demand. Recent advances show that natural fibers like cotton can be nano-engineered for radiative cooling, combining comfort, affordability, and sustainability while addressing growing needs for energy efficiency and thermal management.

Optimising Radiative Cooling Fibers

Daniel J. Glass[1], Alex Y. Song[1], Stuart C. Hawkins[2], Boris T. Kuhlmey[1]*

[1]The University of Sydney, Australia

[2]Macquarie University, Australia

***Presenting author:** *Daniel J. Glass (dgla4746@uni.sydney.edu.au)*

Radiative cooling clothing is an emerging alternative to air-conditioning for those living or working in ever-warmer climates. Cooling properties in textiles can be achieved through the introduction of microscopic pores into otherwise ordinary polymers. The strong index contrast between the polymer and air supports Mie resonances for pore diameters comparable to solar wavelengths. These resonances scatter sunlight efficiently, making the fabric opaque and shielding it from solar absorption. Simultaneously, common polymers such as polyester and nylon are mid-infrared emitters in the atmospheric window, exporting heat into the sky. The result is cooling performance achieved with inexpensive materials that are industrially ubiquitous. Yet, the development of porous cooling fibres requires navigating an enormous design space of materials, pore positions and radii. At present, there are no established first-principles tools for simulating and optimising ensembles of densely packed, randomly distributed scatterers. As a result, the question of what constitutes the optimal cooling fibre geometry remains unresolved. To make this question tractable, we constrain the fibre

geometries to ensembles of non-overlapping parallel cylinders. This permits the implementation of a multipole method, in which cylindrical symmetry is leveraged to expand the electromagnetic fields into a basis using Bessel and Hankel functions. Here, Maxwell's equations reduce to a linear algebra problem: a transfer matrix mapping incident and outgoing coefficients. We have implemented this model within the automatic differentiation library PyTorch. Consequently, figures of merit such as fibre backscattering efficiency and absorption yield pre-computed gradients with respect to pore position and radius. These gradients guide efficient searches across the enormous design space of fibre geometries, pinpointing structures that maximise cooling.

Long-propagating ghost phonon polaritons enabled by selective mode excitation

*Yuerui Lu**

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The ability to precisely control the excitation of phonon polaritons (PhPs) provides unique opportunities for various nanophotonic applications, such as on-chip optical communication, quantum information processing, and controlled thermal radiation. Recently, ghost hyperbolic phonon polaritons (g-HPs) have been discovered, which exhibit in-plane hyperbolic dispersion on the surface and oblique wavefronts in the bulk. These g-HPs exhibit long-range, ray-like propagation, which is highly desirable. However, selective excitation of polaritonic modes and flexible control over the directionality of g-HPs remains an open problem. In this work, we experimentally demonstrate that changing the shape of the launching micro/nano antenna allows for control over the polariton mode excitation. Using a single asymmetric triangular gold antenna fabricated on a calcite crystal surface, we showcase highly directional g-HP excitation through selectively exciting desirable polariton modes. Our near-field imaging experiments verify that the g-HP excited by the triangular antenna can propagate over 80 microns, which is consistent with our numerical predictions. Overall, by combining g-HP theory with structural engineering, our work has further developed the potential of such anisotropic materials, enabling unexpected control over g-HPs, thus opening opportunities for various applications in mid-IR optoelectronics.

Shaping thermal radiation with chiral metasurfaces

*Yuri Kivshar**

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***Presenting author:** *Yuri Kivshar (yuri.kivshar@anu.edu.au)*

Thermal emission is usually thought to be incoherent and unstructured, and metasurfaces have been suggested to enabling self-focused thermal radiation, where in-plane spatial coherence combined with local resonances can be used to realize emission with controlled spatial phase profile. Here, we employ chiral metasurfaces to efficiently achieve circularly polarized thermal emissions with both high temporal and spatial coherence. We design a novel type of chiral metasurface based on waveguide arrays with periodically shifted segments that have a saddle-shaped chiral and high-Q dispersion band [1]. This simple planar structure supports high chiral responses over a wide wave vector range near the Γ point, without requiring traditional multilayer or complex tilted etching techniques for realizing the structures with quasi-bound states in the continuum that only support chiral responses at a single k-point. The parabolic shape along one direction ensures minimum involvement of spatial/Fourier components at each frequency, thereby achieving circularly polarized thermal emission with high spatial coherence. Meanwhile, the flatband behaviour along the other direction allows the use of a slot-shaped spatial filter and a mid-infrared lens to collect emissions from large-area metasurfaces, thus improving power collection efficiency without affecting temporal coherence. Our experiments demonstrate circularly polarized thermal emissions with high temporal coherence ($Q > 200$) and very large circular dichroism (~0.8).

References

[1] Sun et al., Sci. Adv. 11, eadw0986 (2025)

Sydney Radiative Cooling Workshop 2025

DAY 2

FROM URBAN MATERIALS TO WATER AND ENERGY HARVESTING

Passively Cooled Paint-Like Coatings for Atmospheric Water Capture

*Ming Chiu[1,3,4], Emile Theau[1], Angus Harrison[1], Johanna M. Terpstra[3,4], Riccardo Parin[3,4], C. Martijn de Sterke[2,3], Tristram J. Alexander[2], Chiara Neto[3,4]**

[1]*Dewpoint Innovations, Sydney, Australia*

[2]*Institute of Photonics and Optical Sciences (IPOS), The University of Sydney, Australia*

[3]*The University of Sydney Nano Institute, The University of Sydney, Australia*

[4]*School of Chemistry, The University of Sydney, Australia*

***Presenting author:** *Chiara Neto (chiara.neto@sydney.edu.au)*

Atmospheric water capture has the potential to alleviate water scarcity around the world and works by condensing water vapor onto a cold surface. However, actively cooling a surface requires substantial energy. We report the application of large scale (20 × 20 cm2) porous polymer coatings with ultra-high total solar reflectance (97%) and emittance (98% in the atmospheric window), which can passively cool 6ºC below ambient temperature when exposed to the sky, even under direct sun. When the coating cools below the dew point, it harvests water from the atmosphere through condensation of droplets. Thanks to the application of a smooth UV-resistant topcoat promoting water droplet roll-off, 390 mL/m2/day of water could be collected, entirely passively. A longitudinal six-month study demonstrates that the coatings are functional, robust, and suited to long-term outdoor deployment. The minute-by-minute recording of the surface cooling, water capture and weather factors over six months, allow to identify the major factors impacting the surface performance in Sydney, Australia, and a theoretical model extends the water capture prediction to the rest of Australia. These insights will advance cool roof coatings, and advance the provision of sustainable, delocalized and low-cost sources of water from the atmosphere.

Radiative Cooling with Coloured Materials: Comparable Summer Benefits to White Surfaces and Improved Winter Balance in the Built Environment

Hassan S. Khan[1,2], Ioannis Kousis[2], Mat Santamouris[2]*

[1]School of Engineering and Technology, Central Queensland University, Sydney, Australia

[2]School of Built Environment, University of New South Wales, Australia

***Presenting author:** *Hassan S. Khan (h.khan@cqu.edu.au)*

Urban surfaces absorb large amounts of solar radiation, intensifying ambient temperatures and contributing to urban overheating, greenhouse gas emissions, energy demand, and heat-related health risks. Passive Daytime Radiative Coolers (PDRCs), typically white or silver in colour, offer sub-ambient cooling through high solar reflectance and strong thermal emissivity in the atmospheric window. However, their adoption in urban environments is constrained by optical glare, aesthetic limitations, and the potential for winter overcooling in heating-dominated regions. To address these challenges, fluorescent-based Passive Coloured Radiative Coolers (PCRCs) have been developed as an alternative. Incorporating quantum dots and fluorescent dyes, PCRCs provide colour while enabling a fluorescence-based cooling mechanism that reemits absorbed solar radiation. This reduces reliance on absorbing pigments, improves the thermal balance, and mitigates visual discomfort. In this study, three PCRC prototypes (orange, green, and red) were fabricated and tested under contrasting climates: the hot-arid desert conditions of Alice Springs (Australia) during autumn, and the humid-cold winter conditions of Sydney (Australia). Among the prototypes, the orange-fluorescent PCRC demonstrated the best performance. Under Alice Springs conditions, it achieved surface temperatures comparable to highly reflective PDRCs and up to 2.7 °C cooler than a conventional white roofing membrane during daytime. At night, all PCRCs recorded surfaces 7–8 °C below ambient. Under Sydney's winter conditions, the orange prototype achieved ~4.5 °C higher surface temperatures than the white reference, attributed to the lower infrared transmittance of its polymer matrix. These results demonstrate the potential of PCRCs to provide seasonally balanced thermal performance while overcoming the optical and aesthetic drawbacks of conventional radiative coolers.

Energy harvesting from radiative cooling

*Sid Assawaworrarit**

The University of Sydney, Australia

***Presenting author:** *Sid Assawaworrarit (sid.assa@sydney.edu.au)*

In this talk, I will describe the physics and development of a radiative cooling energy harvesting system. This system generates electricity by harvesting thermal radiation from Earth's surface to the cold universe, utilising Earth's ambient heat as the energy source. I will cover our journey in radiative cooling energy harvesting experiments, starting with an early proof-of-concept work, moving through iterations aimed at optimising power generation density, and to our recent demonstration achieving record power density of 350 mW/m^2. This milestone was achieved through the combination of an optimised thermal radiator with emissivity tailored to the Earth's atmospheric transparency, optimal thermal radiator's operating temperature, and vacuum insulation. I will also discuss this realised performance in the context of theoretical limits for energy harvesting from Earth's thermal radiation.

THERMORADIATIVE POWER & TPV SYSTEMS

Graphene for efficient thermoradiative energy harvesting

*Michael Fuhrer**

Monash University, Australia

***Presenting author:** *Michael Fuhrer (Michael.Fuhrer@monash.edu)*

I will discuss the application of graphene to thermoradiative devices capable of harvesting work from outgoing thermal radiation from a near room-temperature device to a cold environment such as the night sky. The hot- (or cold-) electron photothermoelectric effect in graphene allows for conversion of radiation to electrical work with high internal quantum efficiency. Efficient coupling of graphene to far-field radiation in the mid-infrared atmospheric window (8-14 microns) appears feasible using nanoplasmonic resonant surfaces. I will discuss the prospects and challenges for graphene thermoradiative devices.

Semiconductor thermoradiative power conversion

Ned Ekins-Daukes, Michael Nielsen, Stephen Bremner, Peter Reece*

University of New South Wales, Australia

***Presenting author:** *Ned Ekins-Daukes (nekins@unsw.edu.au)*

Thermoradiative power can be generated from radiative exchange between bodies at different temperatures. Recently, low-bandgap semiconductor diodes have been used to perform this, providing instantaneous electrical power from the radiative exchange between the diode and a cold external environment. When a warm diode is placed in a radiatively cold ambient, a reverse electrical bias develops that can drive electrical current around an external circuit delivering power. While relatively large voltages are possible in principle from a thermoradiative diode, in practice the voltage from diodes measured to date are low (microvolts) due to the presence of non-radiative losses within the diode. Among many opportunities for radiative heat recovery, the possibility for generating solar power from the cold night sky stands out as a remarkable application of this technology. Recent theoretical calculations show that a power density of several tens of W/m2 are attainable from a warm, 300K surface in space, the Earth's atmosphere reduces this to 1W/m2 due to downwelling mid-infrared photons from optically opaque spectral regions of the atmosphere.

Minimizing Radiative Cooling Load in Space Thermophotovoltaic Systems

*Yixin Sun, Zhongyan Li, Xiaoqi Zhou, Xiawa Wang**

Duke Kunshan University

***Presenting author:** *Xiawa Wang (xiawa.wang@dukekunshan.edu.cn)*

Thermophotovoltaic (TPV) systems powered by radioisotope heat sources offer compact, long-lived energy solutions for extrasolar space missions. However, in vacuum environments where only radiative cooling is possible, managing excess heat from high-flux radioisotopes becomes a critical challenge. This work presents a system-level approach to reduce the cooling load by co-designing the emitter spectrum, spectral filters, and TPV cell bandgap. Combined with geometric optimization of radiators for efficient heat rejection to deep space, our strategy enables lower operating temperatures and improved system efficiency, providing a pathway for scalable, high-performance TPV systems in radiative-only environments.

FUNDAMENTALS & DETECTION FOR THERMAL PHOTONICS

Directional thermal radiation

*Wei Li**

Chinese Academy of Sciences

***Presenting author:** *Wei Li (weili1@ciomp.ac.cn)*

Thermal radiation is a ubiquitous phenomenon, with all objects at finite temperatures emitting radiation due to the thermally induced motion of particles and quasiparticles. This typically results in thermal radiation that lacks directionality in the far field. In this talk, I will discuss our recent work on the directional control of thermal radiation, including angular-asymmetric spectrally-selective thermal radiation, broadband directional and unidirectional thermal radiation, and their implications for improving the efficiency of radiative heat transfer. Toward the end of the talk, I will also briefly discuss the potential of angular photon control for information detection and processing.

Mid-wave infrared detection with bulk black phosphorus

James Bullock, Alexander Corletto*

University of Melbourne, Australia

***Presenting author:** *James Bullock (james.bullock@unimelb.edu.au),*

Layered van der Waals materials have emerged as promising candidates for infrared (IR) photodetectors, spanning the short-wave to long-wave IR spectrum. Among these, bulk black phosphorus (bP) stands out as one of the highest-performing materials, with demonstrated room-temperature detectivities approaching ~10^10 Jones in the mid-wave IR range. A key advantage of layered materials lies in their out-of-plane van der Waals bonding, which enables the isolation of thin layers without incurring significant surface recombination losses. This is particularly beneficial for IR detection, where reducing the absorber thickness can suppress volume-dependent noise. Such an approach is often impractical with traditional semiconductors, where surface recombination imposes limitations on device thickness scaling. Layered van der Waals materials can also be integrated with advanced optical architectures to maintain efficient light absorption. In this presentation, we highlight recent progress in developing IR photodetectors based on black phosphorus. We discuss the integration of these devices with optical structures and explore the potential of black phosphorus in enabling reconfigurable detector platforms.

Mid-infrared metasurfaces for chemical detection

*Kenneth B. Crozier**

University of Melbourne, Australia

***Presenting author:** *Kenneth B. Crozier (kenneth.crozier@unimelb.edu.au)*

The identification of chemicals from their mid-infrared spectra has applications that include the industrial production of chemicals, food production, pharmaceutical manufacturing, and environmental monitoring. This is generally done using laboratory benchtop tools. Although such systems offer high performance, alternative platforms offering reduced size, weight, and cost can enable a host of new applications. In this presentation, we will describe our work [1] on a compact microspectrometer platform for chemical identification. Our platform comprises a nanophotonic filter chip integrated with a miniature thermal camera. The nanophotonic chip is silicon with a thin gold coating. It contains twenty spectral filters (each 100×100 μm2) that span the wavelength range 6-14 μm. Experiments are performed by placing the material to be studied between an IR blackbody source and the IR microspectrometer. We have demonstrated that this platform can be used with a machine learning (ML) algorithm. After this is trained, it can quickly identify and quantify unknown chemicals with high accuracy from the measured sensor output. High accuracy identification of four liquid chemicals, concentration quantification of ethyl lactate in cyclohexane down to subpercentage levels, and the classification of food and drug samples is demonstrated. We will furthermore describe recent work in which the platform is used to detect hazardous and climate change gases [2].

References

[1] Meng, J., Weston, L., Balendhran, S., Wen, D. Cadusch, J.J. Rajasekharan Unnithan, R. and Crozier, K.B. 2022 Laser Photonics Rev. 2100436

[2] Meng, J., Balendhran, S., Sabri, Y., Bhargava, S.K., and Crozier, K.B., 2024 Microsystems & Nanoengineering 10:74

Appendices

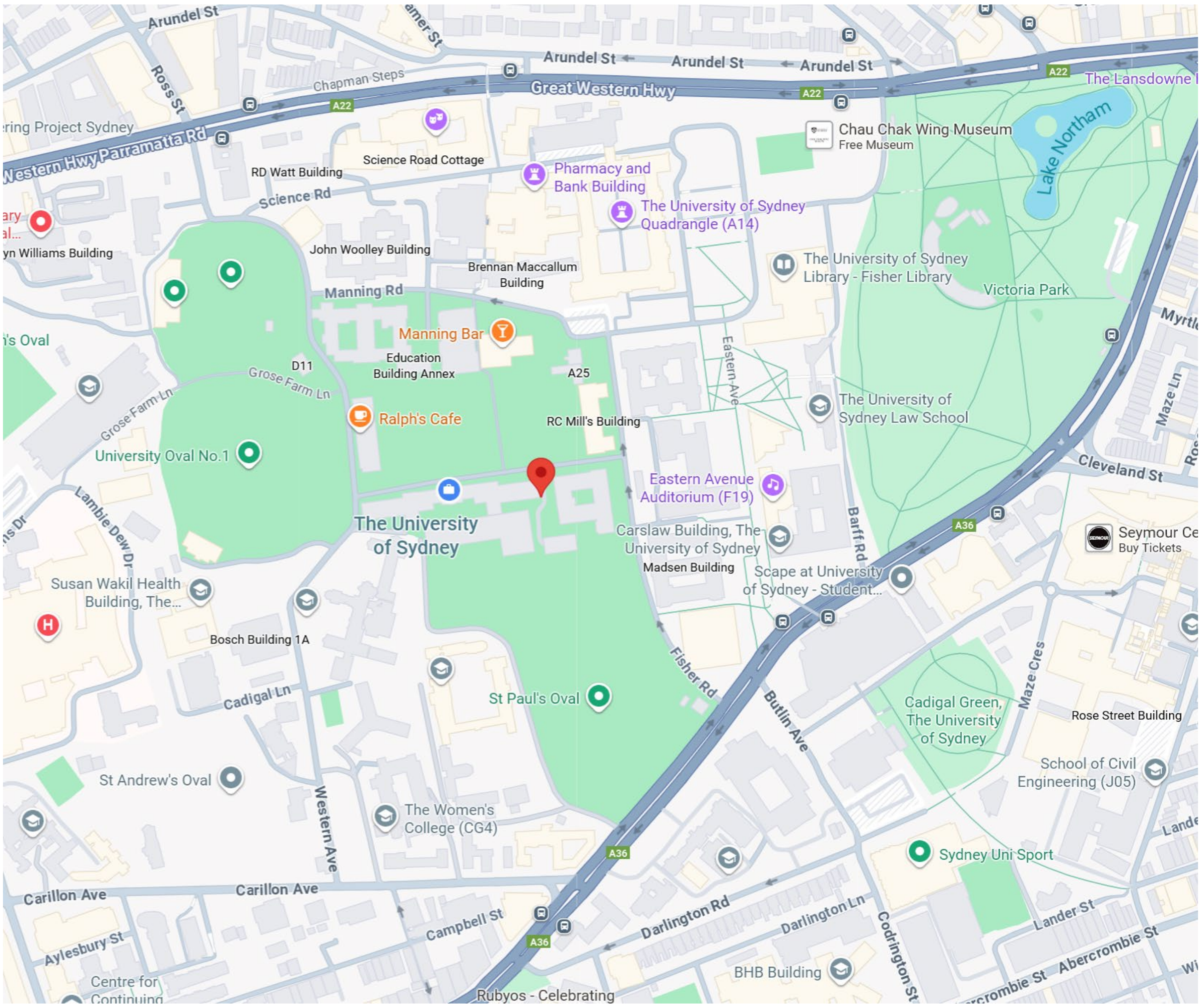
A – Speaker information

Speakers are requested to upload their presentation using a USB key to the lectern computer prior to their scheduled session and identify themselves to the session chair. A separate preparation room (room 3003) with identical lectern setup is available throughout the workshop to test presentations. Files need to be uploaded in the workshop venue room 3001 directly: Files uploaded in the preparation room (3003) will ***not*** be available in 3001.

B – Venue information and map

All presentations will be in room 3001 of the Syndey Nano Hub building A31, Physics Road, The University of Sydney (Camperdown Campus).

Access to the venue is through Physics Road. [Interactive map]



Public transport: best bus stops are City Rd near Butlin Ave, and Paramatta Rd near Ross st or Parramatta Rd opposite University of Sydney Footbridge. The closest train station is Redfern (~20 minute walk).

Catering during breaks will be in the areas adjacent to the room.

Male and female bathrooms are on the same level. An all-gender bathroom is situated in the adjacent School of Physics on level 2. Rest and parents room can be found in level 1 (basement) of the School of Physics.

The optional workshop dinner will be held at Rubyos on King street in Newtown, a ten-minute walk from the workshop venue. Pre-registration for the dinner is compulsory, and attendees will be asked to pay a subsidised fee of $50 upon arrival of the restaurant covering food only (banquet menu). Beverages can be ordered at the bar.