EndoR Surgical System

華陀外科手術系統

Professor Philip Chiu Wai-yan

趙偉仁教授

Abstract

Gastrointestinal (GI) cancers are among the most prevalent cancers worldwide. Early detection through screening and advanced diagnostic technologies can significantly improve outcomes by enabling timely intervention. Endoscopic submucosal dissection (ESD) has emerged as a minimally invasive treatment modality for early-stage GI cancers, offering complete tumour removal while preserving healthy tissue. However, ESD's steep learning curve and reliance on surgical expertise limit its widespread adoption and consistency in patient outcomes.

To address these challenges, Professor Philip Chiu Wai-yan and his research team have pioneered a breakthrough robotic platform that integrates flexible robotics technology to revolutionise endoluminal surgery. The system enhances precision, dexterity, and safety during ESD, helping doctors treat patients more effectively and with fewer complications. The platform represents a significant step forward in medical robotics and minimally invasive surgery, offering new hope for patients with early gastrointestinal cancers.

消化道癌症是全球最常見的癌症之一。若能透過篩檢及先進診斷技術及早發現，便可及時介入治療，大幅提升治癒率。內鏡黏膜下剝離術（ESD）作為早期消化道癌症的標準微創治療方法，既能完全切除腫瘤，又能保留健康組織。然而，ESD 技術門檻高且高度依賴外科醫生的操作經驗，故限制了其廣泛應用，患者治療效果亦存在差異。

為應對這些挑戰，趙偉仁教授及其研究團隊率先開發創新的機械人平台，整合柔性機械人技術來革新腔內手術。該系統提升了 ESD 手術的精準度、靈活性和安全性，讓醫生能更有效治療患者，同時減少併發症。這項技術標誌著醫療機械人及微創外科手術的重大突破，為早期消化道癌症患者帶來新希望。

Evolving Interventional Endoscopy – An Endoluminal Robotic Platform for Early-Stage Cancer Resection and Defect Closure

不斷發展的介入式內窺鏡技術——

一種用於早期癌症切除和缺損閉合的自然腔道手術機器人平台

Professor Kwok Ka-wai
郭嘉威教授

Abstract

Led by Professor Kwok Ka-wai, this project focuses on developing miniaturised (Ø2.8-3.5 mm), fully flexible robotic instruments to address the challenges of endoluminal surgeries, which are a vital part of early-stage cancer treatment. Current conventional instruments often make complex procedures difficult to perform and require extensive training. This innovative robotic system offers surgeons unprecedented dexterity and simplified control while being compatible with existing flexible and rigid endoscopes. It is designed to target two key patient groups: upper and lower gastrointestinal (GI) cancer patients, and bladder cancer patients.

This project aims to expand the robotic system for use in gastrointestinal tumour resection, reach the stages of regulatory submission and clinical trials, and introduce robotic tissue closure/suturing capabilities, which is critical for repairing tissue perforations.. These advancements will enable a versatile system capable of addressing both GI and bladder tumour resections. The addition of suturing tools will reduce complications, promote faster recovery, and provide a comprehensive solution for endoluminal surgeries. Ultimately, the project will lower training barriers and make advanced, incision-free surgical techniques more accessible.

該研究項目專注於開發全柔性微型（Ø2.8-3.5 mm）機械臂，以解決自然腔道手術中的挑戰。自然腔道手術是早期癌症治療的重要方法之一，但使用傳統器械的手術操作複雜，並需要大量培訓。該創新機械人系統為外科醫生提供了前所未有的靈活和簡化的操作控制，同時可以與現有的柔性和剛性內窺鏡兼容。該機械人系統主要針對兩類患者群體：上、下消化道早期癌症患者及膀胱早癌患者。

本項目旨在將機械人系統拓展至適用於胃腸道腫瘤切除，並達到註冊申請及臨床試驗階段，以及引入組織閉合/縫合功能，這對於修復組織穿孔至關重要。 這些進展將使該系統成為一個多功能平台，能夠同時應對胃腸道和膀胱腫瘤切除需求。縫合工具的加入將減少術後併發症，促進患者更快康復，並為自然腔道手術提供更全面的解決方案。最終，該項目將降低手術培訓門檻，使更先進的無切口手術技術更加易於實現和普及。

Low-Cost and Intrinsically-Safe Polysulfide Redox Flow Batteries for Long-Duration Energy Storage
用於長時儲能的低成本及本徵安全硫基液流電池

Professor Lu Yi-chun
盧怡君教授

Abstract

Professor Lu Yi-chun's team at The Chinese University of Hong Kong (CUHK), in partnership with CUHK spin-off company Luquos Energy, is pioneering a new battery technology that's intrinsically safe, more affordable, and environmentally friendly—designed to help store solar and wind power more efficiently as we move toward a net-zero future. Unlike conventional lithium-ion batteries, which pose fire risks and are hard to recycle, this new solution uses sulfur—a plentiful and low-cost material—and water-based components to eliminate safety hazards while slashing costs by up to 50% compared to lithium-ion and 75% compared to vanadium flow batteries. Packed with CUHK-invented innovations, including high-performance membranes, power-boosting catalysts, and smart AI battery systems, the project aims to bring this cutting-edge tech to life through real-world deployments in renewable energy storage, data centers, EV charging, and more—all while positioning Hong Kong as a global leader in sustainable energy innovation and supporting climate goals in Hong Kong, the mainland, and beyond.

本項目由盧怡君教授團隊，聯同中大初創企業易池新能（Luquos Energy），共同開發一項新的液流電池技術，旨在推動本徵安全、低成本、長壽命的能源儲存解決方案，加速邁向淨零碳排放的未來。與現時普遍使用的鋰離子電池相比，這種新型電池以地球上豐富且低成本的硫元素作為核心材料，配合水溶性電解液，不但解決了起火風險，更有望將成本減半，甚至比釩液流電池便宜七成。中大團隊還研發出多項創新技術，包括高效選擇性的離子交換膜、能提升電池效能的分子催化劑，以及由人工智能驅動的電池管理系統，以確保整體運作高效可靠。本項目將把這些先進技術推向實際應用層面，涵蓋可再生能源儲存、數據中心備用電力系統和電動車充電設施等領域，同時推動香港在可持續能源創新上的全球領導地位，並助力香港、內地以至全球實現碳中和目標。

MicroSigX Develops First-in-class Microbiome Test to Transforms Global Health
微識生物研發全球首創微生物組檢測技術　引領全球醫療革新

Professor Siew Ng
黃秀娟教授

Abstract

The project team led by Professor Siew Ng and Professor Francis Chan and MicroSigX Biotech Diagnostic Limited are pioneering a new generation of non-invasive diagnostics for two major health challenges: Inflammatory Bowel Disease (IBD) and Autism Spectrum Disorder (ASD). IBD is a chronic gastrointestinal condition affecting millions worldwide, often misdiagnosed due to overlapping symptoms with other gut disorders. ASD is a neurodevelopmental disorder that impacts 1 in 36 children globally, with diagnosis often delayed due to reliance on subjective clinical assessments.

The project introduces two breakthrough technologies: Enterosight, a stool-based PCR assay for IBD, and MetaGenie, an AI-powered metagenomic platform for ASD. Both tests use microbial signatures to deliver accurate, affordable, and rapid diagnostics from a single stool sample.

Enterosight has demonstrated cost savings of over 90% compared to traditional colonoscopy-based diagnosis. MetaGenie is the first stool-based ASD diagnostic to receive FDA Breakthrough Device Designation. These findings have been published in the journals *Nature Medicine* and *Nature Microbiology*, and validated across multi-ethnic cohorts. Their clinical utility and scalability position them for global adoption.

MicroSigX, a CUHK spin-off, leads the commercialisation strategy. With extensive industry experience and investors' support, MicroSigX ensures a clear pathway from lab to market. The company aims to launch both products in Hong Kong by 2027, with plans for FDA and NMPA regulatory approval.

The project is expected to deliver the first microbiome-based diagnostic test fully developed in Hong Kong with a clear roadmap to global regulatory approval, marking a pivotal step in establishing Hong Kong as a leader in the emerging microbiome industry.

由黃秀娟教授與陳家亮教授領導的研究團隊，聯同微識生物科技診斷有限公司，正研發新一代非入侵性診斷技術，針對兩項全球重大健康挑戰：炎症性腸病與自閉症譜系障礙。炎症性腸病是一種慢性腸道疾病，症狀與其他腸道問題相似，常被誤診，影響患者治療時機。自閉症譜系障礙則是一種神經發展障礙，全球每 36 名兒童中就有 1 人受影響，診斷過程繁複且依賴臨床觀察，導致干預延誤。

本項目推出兩項突破性技術：Enterosight，一種基於糞便樣本的 PCR 檢測，用於診斷炎症性腸病；以及 MetaGenie，一個由人工智能驅動的宏基因組平台，用於自閉症譜系障礙診斷。兩項測試均透過分析微生物特徵，從單一糞便樣本提供準確、經濟且快速的診斷結果。

Enterosight 有望將診斷成本降低逾九成，減少不必要的腸鏡檢查，MetaGenie 則已獲美國 FDA 授予「突破性醫療器材」認證。技術成果已刊登於《自然醫學》及《自然微生物學》，並在多族裔群體中驗證其準確性，具備臨床應用及全球推廣潛力。

微識生物作為中大衍生企業，負責商業化策略，憑藉其豐富的行業經驗及投資者支持，確保技術由實驗室順利走向市場。公司計劃於 2027 年在香港推出產品，並啟動美國及中國的註冊程序。

本項目將帶來首個由香港自主研發、具備全球註冊潛力的微生物組診斷技術，標誌著香港在領導微生物組產業發展上的重要里程碑。

Intelligent Laser Sensing System for the Energy Industry

面向能源行業的激光智能傳感系統

Professor Ren Wei

任偉教授

Abstract

The oil, natural gas, and hydrogen energy sectors increasingly require advanced sensing systems for quality analysis, pipeline inspection, and leakage detection. This project aims to leverage the research team'scutting-edge research in laser sensing technologies and artificial intelligence to develop and commercialise a series of intelligent laser-based gas analysers and detectors. These innovative devices will serve a wide range of applications across the oil and gas industry, pipeline inspection, and hydrogen safety, and will be brought to market through the research team's spinoff, LaSense Technology Limited. Through partnerships with key industry stakeholders, the systems will undergo rigorous testing, optimisation, and standardisation through large-scale field trials in Hong Kong and mainland China. This project is strategically aligned with Hong Kong's re-industrialisation initiatives, hydrogen development strategy, and national energy policy objectives, advancing both sensing technology and manufacturing capabilities. The research team believes this initiative will further strengthen Hong Kong's international competitiveness in high-end manufacturing and sustainable energy.

石油、天然氣及氫能行業需要先進的測量系統以實現快速精準的油氣分析和泄漏檢測。面向全球能源行業對高效檢測技術的迫切需求，本項目基於研究團隊在激光傳感領域的領先研究成果，旨在開發並推廣新一代智能化激光氣體檢測系統，以實現油氣的原位在線監測和精準快速預警，並具有穩定耐用等顯著優勢。研究團隊將與其孵化企業朗思科技有限公司深度合作，重點推動創新成果的商業化及業務擴展，特別是在油氣田智能監控、燃氣管網安全巡檢、氫能源儲運全流程監測等領域開展應用示範。本項目涉及能源行業的技術提升和設備製造，契合香港再工業化目標、氫能發展策略、以及國家能源規劃，進一步鞏固香港在高端製造與可持續能源領域的國際競爭力。

Innovative CAR T Cells for Hepato-biliary pancreatic cancers [i-CATCH]

創新 CAR T 細胞應用於肝膽胰臟癌治療

Professor Wong Nathalie

王昭春教授

Abstract

In China, there are 7,500 deaths from solid cancers daily, among which 12% arise from hepatobiliary pancreatic (HBP) cancers. In Hong Kong, HBP cancers are also common. Together with incidences in mainland China, the annual mortality amounts to 350,000 individuals succumbing to HBP tumours. CAR T-cell therapy has the transformative potential to offer cure to HBP patients. The research team aims to drive innovations in CAR T-cell therapies through tumour cell-surface antigen discoveries, robust manufacturing platform and innovative clinical trials. It is formed by an academic-industry partnership with the intention to accelerating R&D advances. Collaboration between academic and industrial players is essential to the successful development and application for marketing authorisation of a CAR T-cell product. The research team has assembled in this RAISe+ project the necessary parties, whom together they aim to take new therapeutic concepts through pre-clinical developments to clinical trials, and commercialisation.

At present, social burden from HBP cancers is high. The research team expects this RAISe+ programme will have significant impact in sculpting treatment option from targeting cell-surface tumour antigens and expedite progress in clinical treatment of patient with HBP tumour through new CAR T-cell engineering and innovative clinical trial designs.

在中國，平均每日有 7,500 人死於實體瘤，其中 12%源自肝膽胰癌症。肝膽胰癌症也是香港常見癌症之一。據統計，全國每年因肝膽胰癌症而死亡的患者人數高達到 35 萬人。CAR T 細胞療法具有為肝膽胰癌症患者帶来突破性的療效和治癒的巨大潛力。研究團隊旨在通過開發腫瘤細胞特異性表面抗原、聯合強大的生產製造平台和創新臨床試驗，致力於推動肝膽胰瘤 CAR T 細胞療法的突破性創新。他們整合了科研單位與醫藥製造企業雙方的優勢，建立長期戰略合作夥伴關係，旨在加速研發進展。學術界與工業界之間的緊密配合，對於創新性 CAR T 細胞產品的成功研發和未來的商業化進程至關重要。因此，他們在此項產學研 1+項目中聚集了涵蓋整個 CAR T 開發流程的各方優勢力量，共同目標是將新的癌症治療概念從臨床前開發推進到臨床試驗階段，並實現 CAR T 細胞產品商業化。

當前，肝膽胰臟癌症已為社會經濟造成了巨大損失和沉重負擔。研究團隊期待此項產學研 1+項目開發精準識別腫瘤細胞表面抗原的新技術，為肝膽胰癌症的治療選項帶來革命性影響，提供更具創新性的 CAR T 細胞療法和臨床試驗方案，以滿足肝膽胰癌症患者日益迫切的醫療需求。