Nanoimager

单分子成像与功能分析系统

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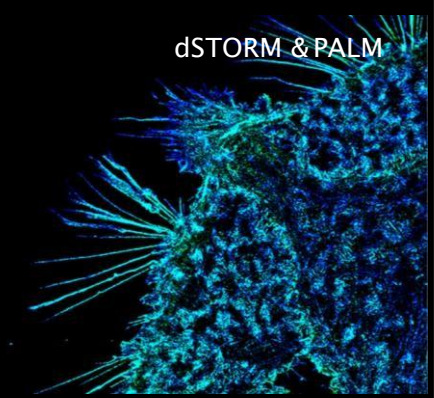
Why the Nanoimager?

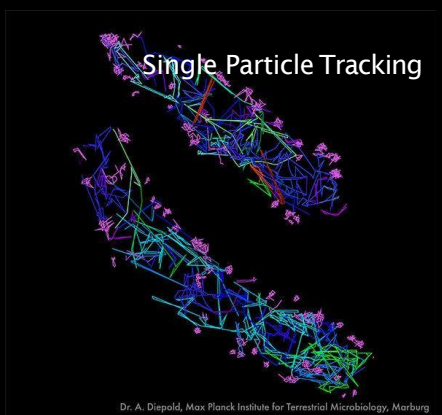
Nanoimager 单分子成像与功能分析系统是由牛津大学Achillefs Kapanidis教授团队研发的一种新型单分子显微镜，也是一款无需校准、无需光学平台、小型台式超分辨荧光显微镜。

Nanoimager 突破了传统光学的衍射极限，分辨率可达20nm，并且系统简单易用、设计紧凑，使用安全无害的一级激光，用户在普通的实验室桌面上即可获得高分辨率的单分子荧光图像。适用于单分子示踪、活细胞成像、蛋白互作、3D成像等研究。

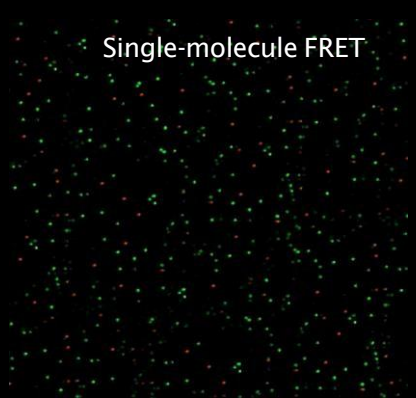
整合三种成像技术于一机



与宽视场技术相比分辨率提高了10倍+



可在两个通道中同时跟踪纳米级粒子



可在2-10nm范围内实时纳米尺操作

应用领域

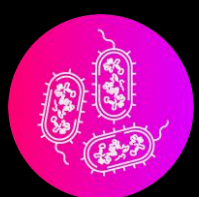
Extracellular vesicles (EVs)
细胞外囊泡

Virus research
Vaccine development
病毒研究、疫苗开发

Cell phenotyping
细胞表型研究

Immunology & immuno-oncology
免疫学与免疫肿瘤学

Neuroscience
神经科学



Bacterial research
细菌研究

集成所有先进成像技术与工艺于一体

20nm
RESOLUTION

Our combination of imaging modalities and advanced software allows single molecules to be observed and tracked with high sensitivity.

AUTOFOCUS
IN REALTIME

Rapid and precise stabilization of the microscope focus, with locking technology to minimize Z-drift.

DRIFT
DRIFT
CORRECTION

Post acquisition drift correction with nanometer precision

TEMPERATURE CONTROL
UP TO 42°

Precise control and measurement of temperature, with heating elements to keep the entire microscope unit at 37°C.
Ideal for live cell imaging, facilitating single-particle tracking.

POWERFUL LASERS

Single molecule localization microscopy in multiple colors and 2 channels.
Up to 1W laser power at the source.
8-12 kW/cm² power density at the sample plane.

MICRO FLUIDICS COMPATIBLE

Powerful solutions to control sample conditions.
DNA paint and RNA hybridization.
Up to 16 channels.
Automation of sample preparation.

Application

CASE STUDY *1*

Enabling super-resolution microscopy imaging in biosafety cabinets

生物安全柜是在处理可能被病原体污染的材料，或者在严格无菌条件下（如GMP实验室）工作时常常用到的设备。然而由于其尺寸和设计的原因，大多数超分辨率显微镜无法支持在封闭式生物安全柜中的研究。

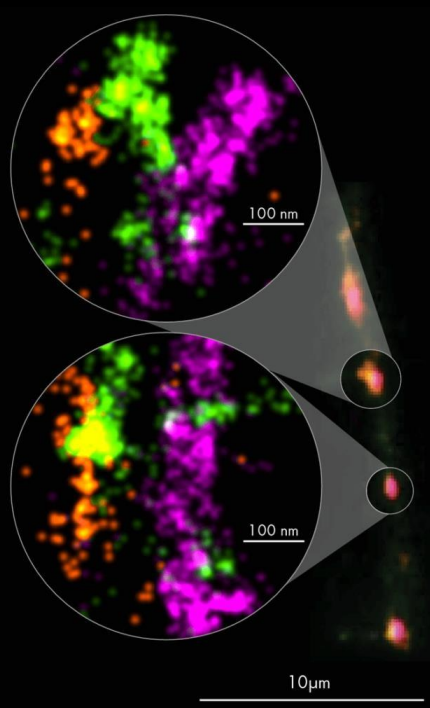
Nanoimager体积小巧，占地面积仅有一张A4纸大小，在生物安全柜中也能捕获最敏感的单分子荧光数据，是P3实验室和P4实验室的理想研究设备。

CASE STUDY *2*

Single-molecule imaging for neuroscience

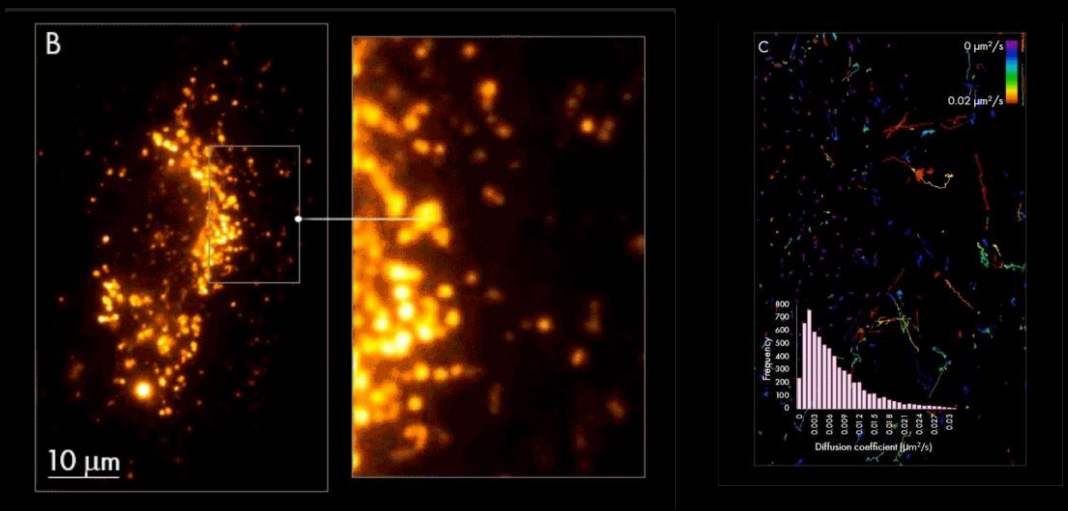
因为突触的大小在200nm以下，传统的光学显微镜是很难观测到它们复杂的分子细节的。 Nanoimager可以描述神经元突触结构，研究突触蛋白的动力学，包括神经递质、核酸和其他生物分子的分子相互作用和分布，从而解决有关大脑功能和功能障碍的基本问题，尤其是当与神经元生态系统内复杂相互作用的研究相结合时。右图揭示了突触前和突触后蛋白质簇之间神经递质小泡的存在和分配。

Rat primary cortical neurons were cultured for 14 days, allowing synapse formation on a dish. Neuronal synapses were visualized in 3 color dSTORM imaging using two presynaptic proteins Bassoon (in magenta) and VGluT1 (in green); and the postsynaptic protein Homer1 (in orange).



CASE STUDY *3*

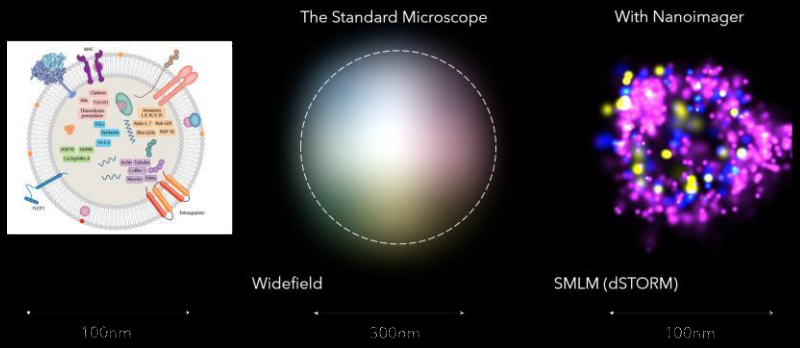
Visualizing EV dynamics and interactions in living cells



Nanoimager通过dSTORM的功能看到在溶液中或细胞中的EVs，分辨率高达20nm。通过跟踪溶液中荧光标记的囊泡的轨迹，来实时研究EV的大小、结构、分子组成和对活细胞的影响。同时也可以提供关于这些粒子在溶液中的大小、浓度和扩散系数等信息。上图展示了EVs与细胞核的相互作用并揭示EVs在癌症中的作用。图中EV由AF488非特异性标记，在数小时后被人Burkitt淋巴瘤细胞摄取。从图像轨迹中获得的信息表明，边缘的囊泡比核附近的囊泡具有更高的扩散系数值，与细胞核相互作用的囊泡的动力学似乎较慢。

CASE STUDY *4*

Super-resolution imaging of EVs



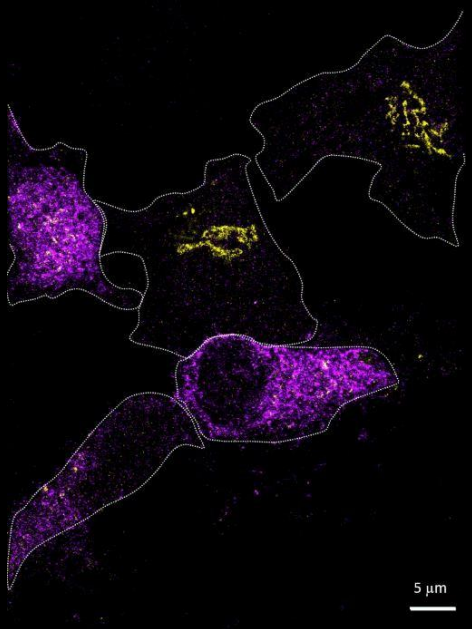
众所周知，细胞外囊泡（EVs）是细胞间通讯的重要媒介，其分子组成反映了其来源细胞及组织的生理状态，是探索很多疾病相关生物标志物的重要研究对象。Nanoimager 是EV表征和成像分析的强大工具，能够在单分子水平上对EV进行全面分析，以确定相关成分的单个分子特征，从而最终利用它们的特性进行诊断和治疗。

CASE STUDY 5

Understanding the effects of viral infection

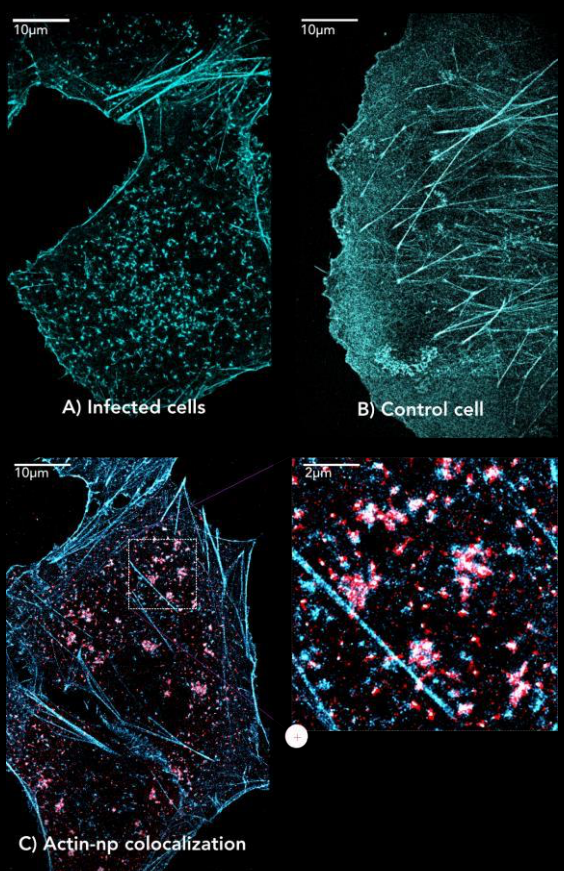
Nanoimager可以对病毒感染后的细胞进行成像以揭示病毒的作用机制。此数据展示了人鼻病毒如何影响高尔基体分裂和蛋白质分泌。

Rhinovirus (viral protein 2C-AF647, purple) infects HeLa cells and disrupts the Golgi (GM130-AF488, yellow). Acquired with Drs A Mousnier and G Schroeder, Queen's University Belfast.



CASE STUDY 6

How does the virus exploit the host cell machinery?



Nanoimager超分辨率图像展示了埃博拉病毒样颗粒对肌动蛋白及细胞骨架的影响。病毒颗粒与被破坏的肌动蛋白网络共同定位，揭示了埃博拉病毒是如何在宿主中复制的，为研究人员提供了可能的治疗靶点。

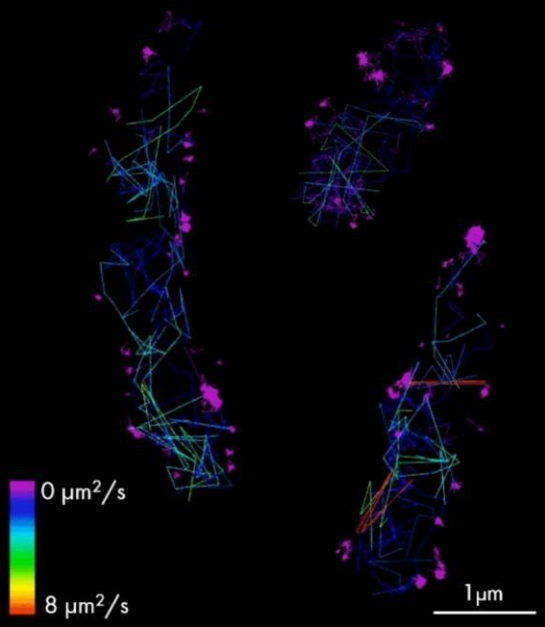
dSTORM image of actin stained with PhalloidinAF647 and antibodies to nucleoprotein-AF555 in Ebola virus-like particle transfected cells.
A) infected actin
B) healthy cell
C) virus protein nucleoprotein (red) colocalizes with disrupted actin network (blue)

CASE STUDY 7

Understanding pathogens with super-resolution microscopy

对于较大的病原体，例如细菌和真菌，Nanoimager的单粒子跟踪可以表征单个分子的行为、细胞结构或染色体标记。该案例显示细菌中T3SS蛋白，被革兰氏阴性细菌用来将效应蛋白注射到宿主细胞中的单颗粒跟踪。单分子示踪（SPT）可以用于描述在感染过程中如何激活和调节T3SS复合物，以及如何控制或抑制其功能。

Single-particle tracking of T3SS-HALO stained with JF549 in live bacteria.



CASE STUDY 8

Capturing organelle contact sites assembly to unveil disease onset in live cells

细胞器之间的膜接触点在细胞内信号传导和代谢途径中起着关键作用。Nanoimager的具有单分子灵敏度，为活细胞中细胞器接触部位的综合表征提供了一个方便且全面的成像平台。
Nanoimager能够同时显示两个荧光载体，允许同时检测内质网和线粒体膜上存在的接触相关蛋白。此数据中图1通过实时跟踪单个PDZD8蛋白（连接内质网和线粒体的分子栓系蛋白）的运动，研究与线粒体网络蛋白质的潜在相互作用。图2进一步分析很好的揭示了PDZD8和线粒体之间的差别，提供了MAM（线粒体相关内质网膜）部位细胞器相互作用的证据。

▽ ER and MAMs (Mitochondria-associated ER membranes) protein PDZD8 (HaloTag®-PA, red) were imaged 'walking' along the ER in fbroblast cells in close vicinity of mitochondria (mitochondrial protein fused to GFP, green).

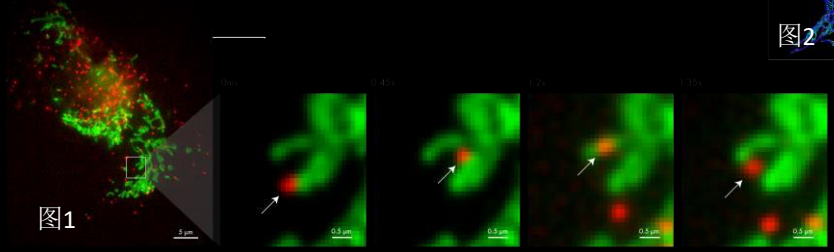


图1

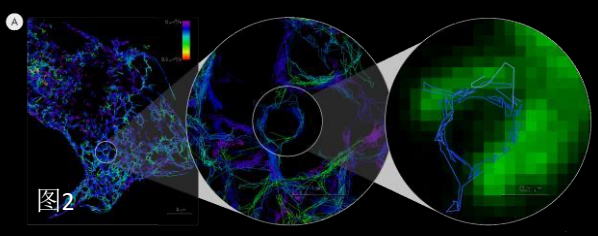


图2

△ Tracking of the MAM protein PDZD8 in fibroblast cells. (A) Individual protein traces were colored according to their diffusion coefficients. Panel on the right shows a selected trace overlaid with a widefield fluorescence signal from mitochondria (green).

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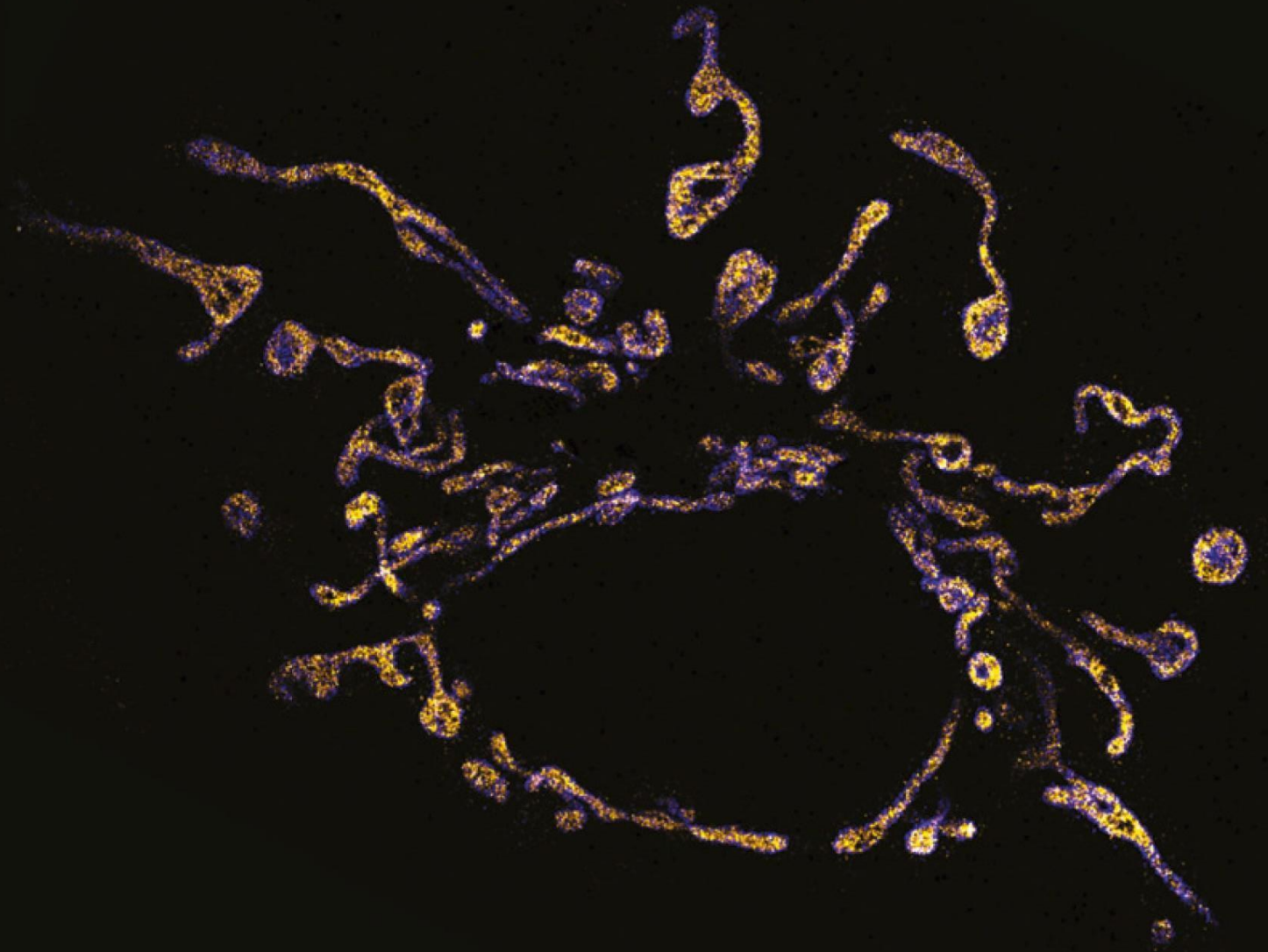

Front cover: Atlastin1 protein walking along the ER in fibroblast cells. Sample provided by Dr. Christopher Obara, postdoc in Jennifer Lippincott-Schwartz lab, Janelia Farm

Applications page: CELL PHENOTYPING: dSTORM image of microtubules (green) and lamins (pink)*; NEUROSCIENCE: neuron labeled with AF568; BACTERIAL RESEARCH: single particle tracking of T3SS-HALO stained with JF549 in live bacteria, Dr. A. Diepold, Max Plank Marburg; IMMUNOLOGY: dSTORM of BCR-AF647 in B-cell, M-type, Dr. Brzostowski, NIH, Bethesda; VIRUS RESEARCH: dSTORM image of Marburg virus nucleoprotein labeled with AF647, prof. S. Becker, Marburg University; EXTRACELLULAR VESICLES: dSTORM image of an EV isolated from human keratinocyte culture media, CD63 (blue),CD81 (yellow), membrane surface (magenta)*.*Samples by ONI Applications Development Team

Back cover: **dSTORM image of mitochondria in Cos7 cells stained with AF647 (Tomm20) and DyLight550 (Hsp60). Sample by ONI Imaging Team**

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