

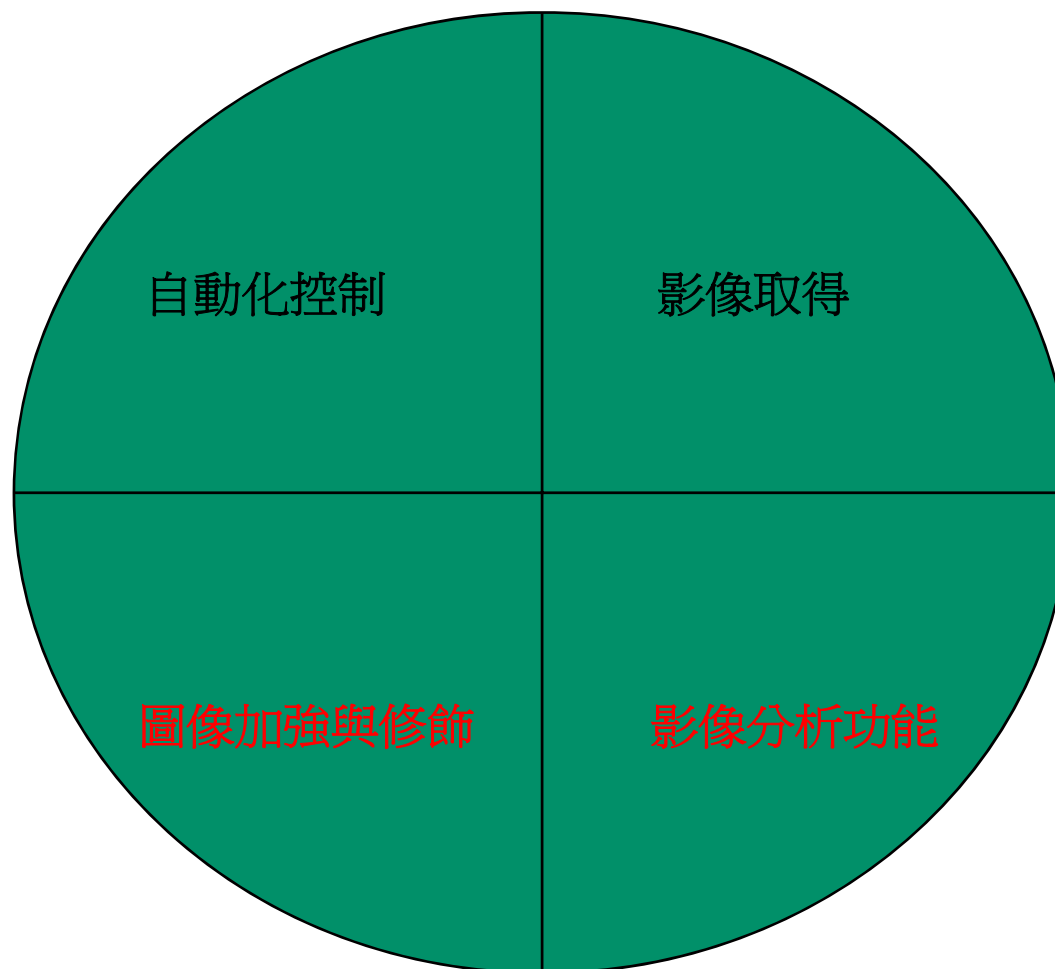


MetaMorph – The Most Powerful Imaging Tool



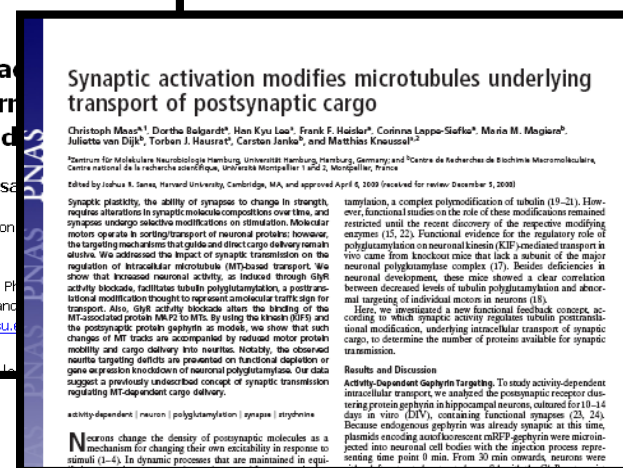
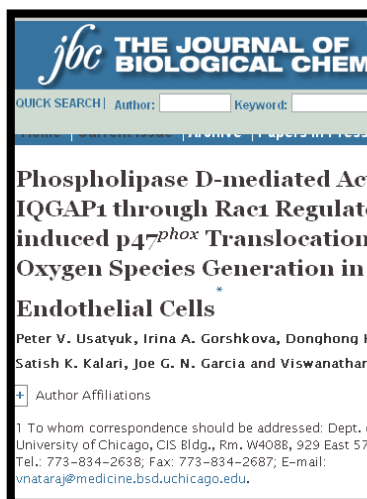
美嘉儀器股份有限公司
Major Instruments Co., Ltd.

MetaMorph® imaging system



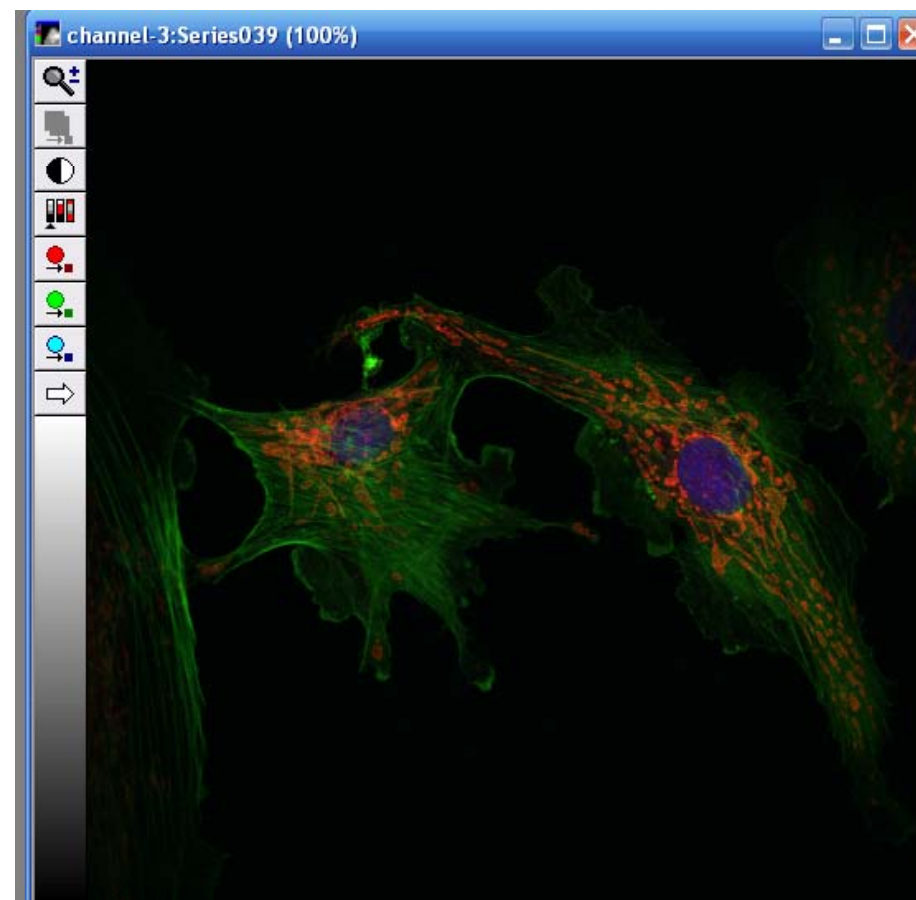
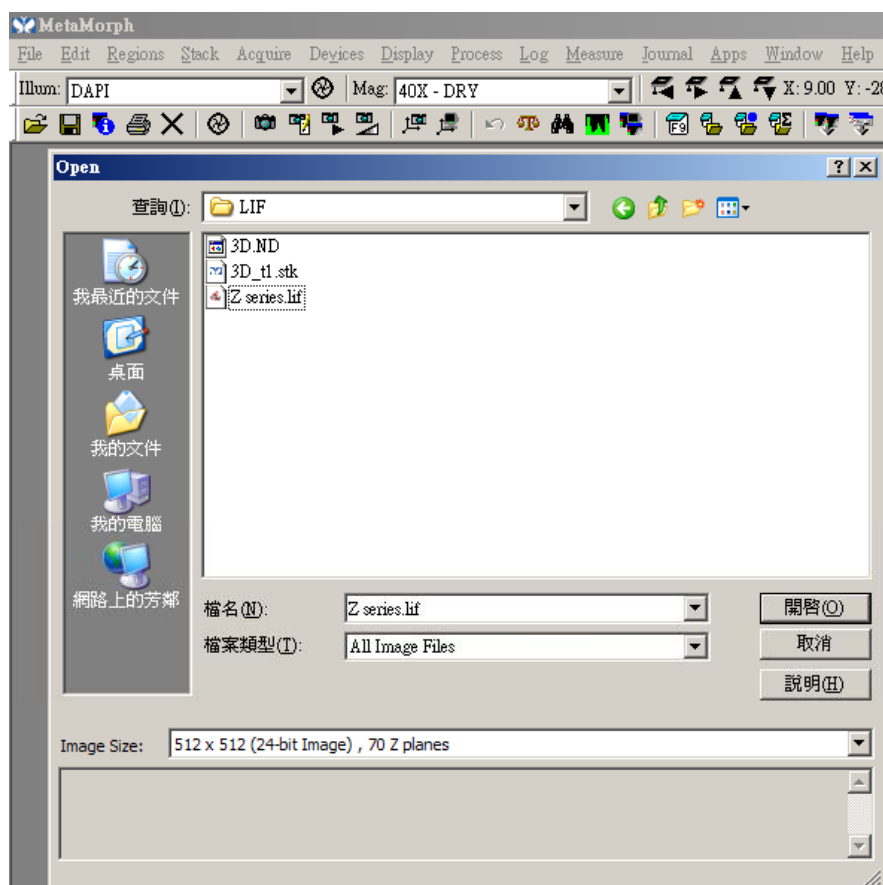
發表論文數眾多

- 共有超過 10472 篇 (持續增加中)
- 2009 年超過1056篇



支援各種影像格式 (.tif, jpg, bmp, **lif...**)

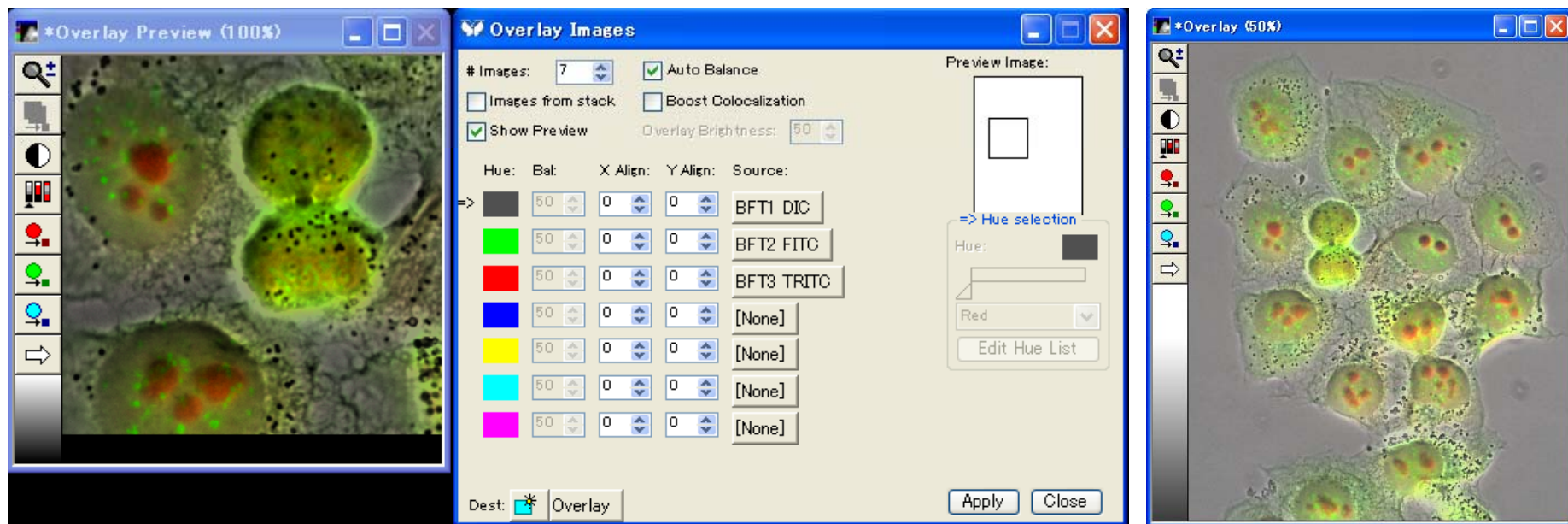
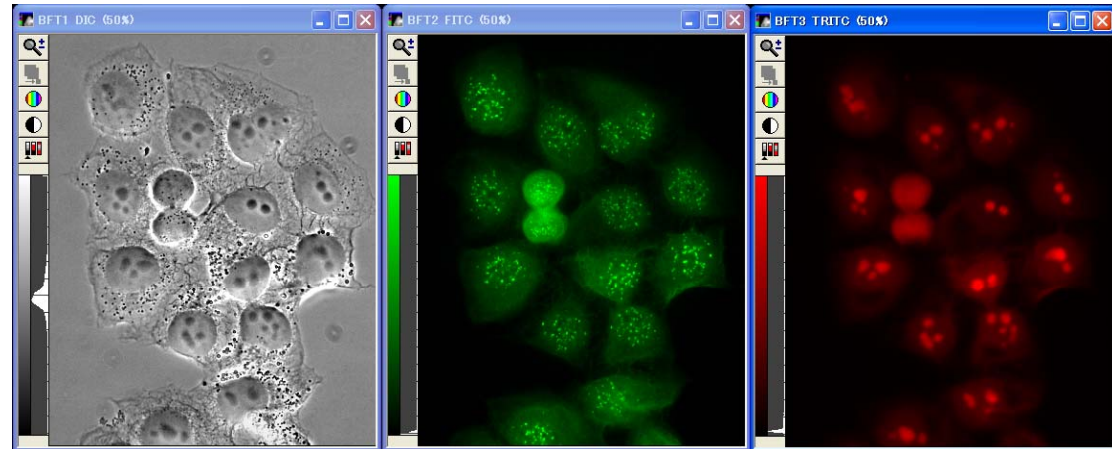
---可分析、量測、展示來自共軛焦影像



Color Overlays (Overlay Image)



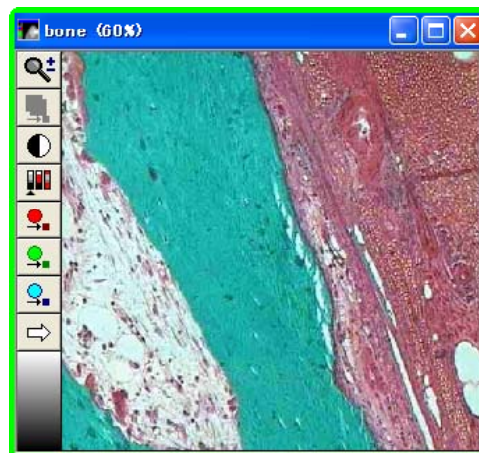
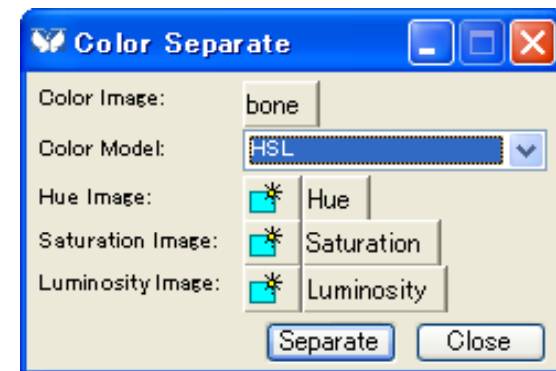
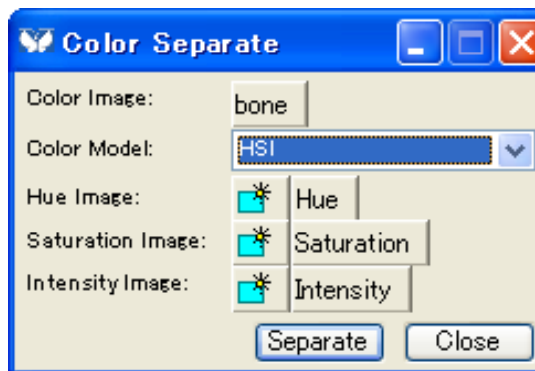
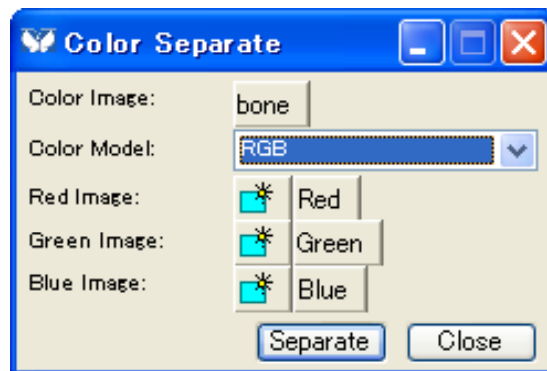
- Display → Overlay Images
- 最多可重疊7 個不同顏色
- 可預覽
- 可作XY align



Color Separate



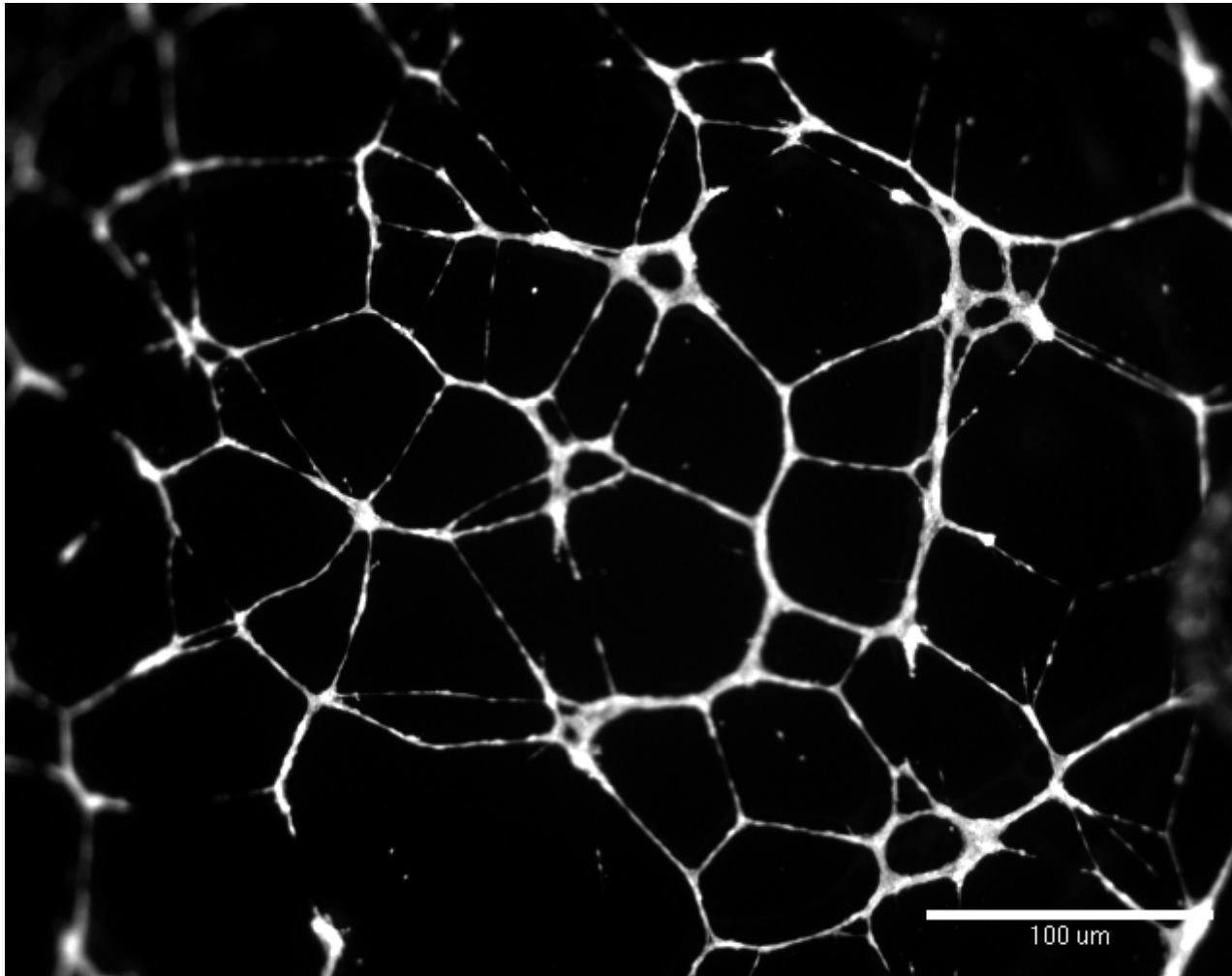
- Display → Color Separate
- RGB, HSI or HSL
- 將彩色影像分離為單色影像



Graphics



Calibration Bar

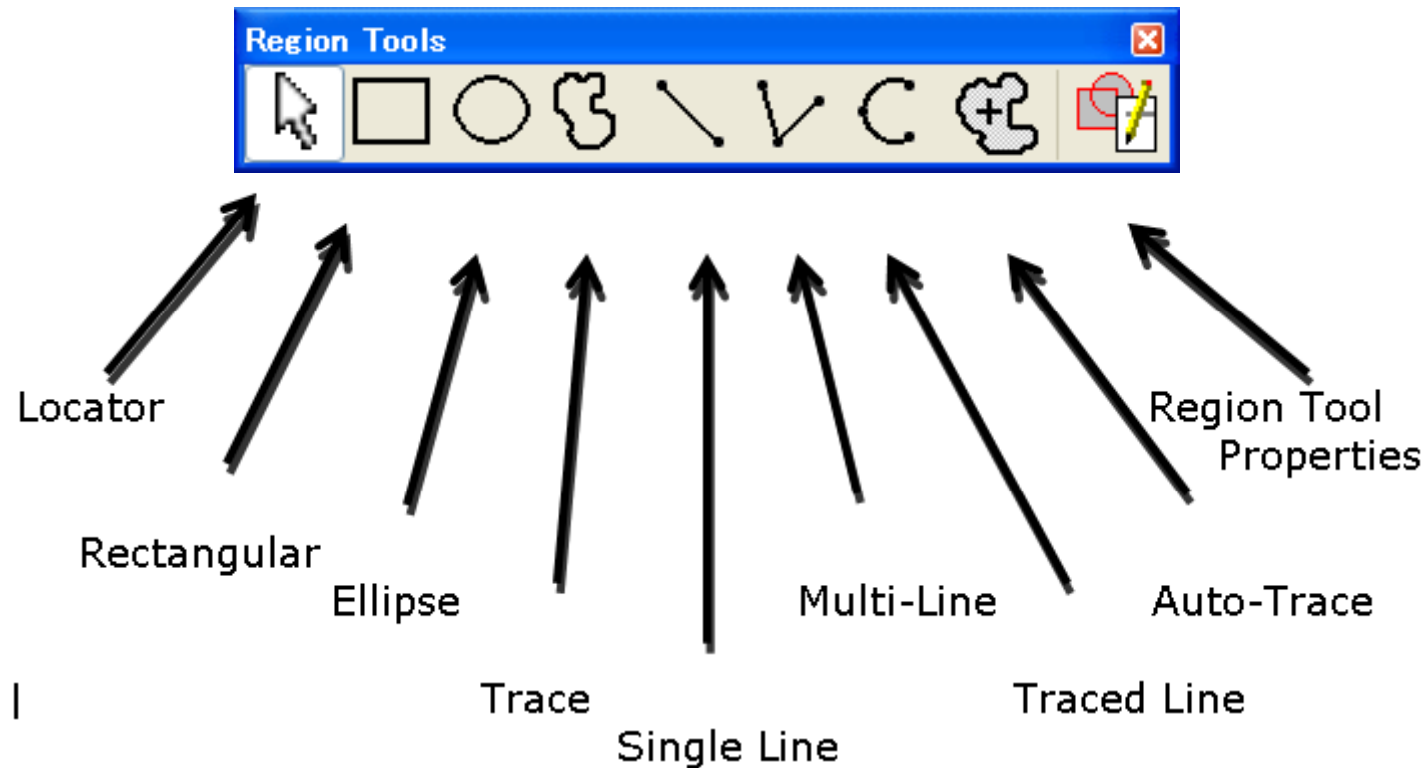


Basic Measurements

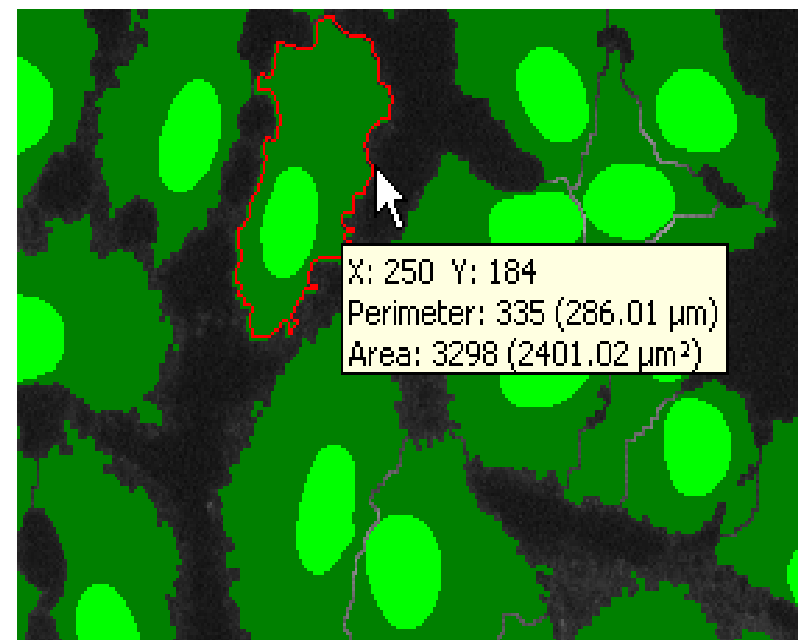
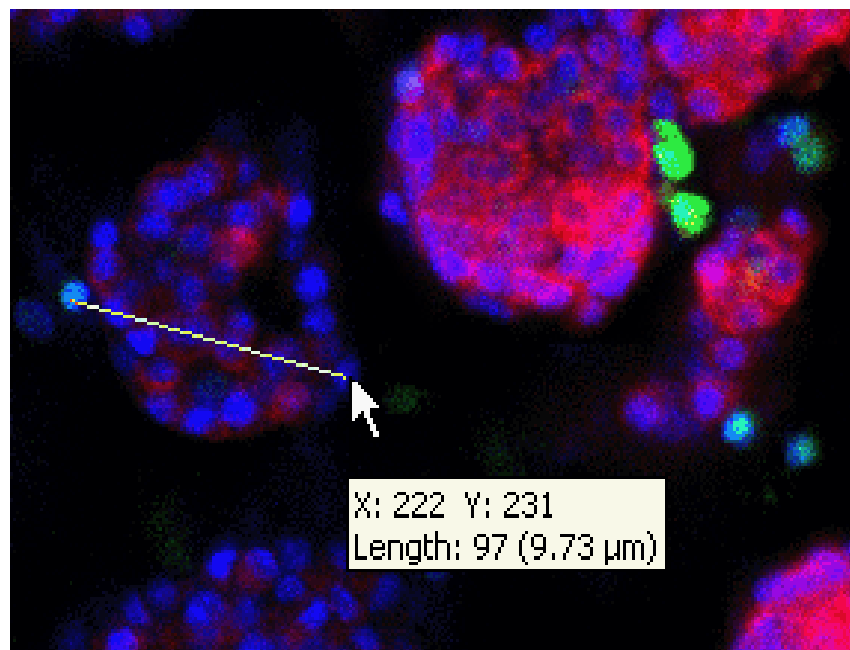


Region Measurements (手動量測)

➤ Area, Distance, Angle, X/Y Coordinate, Width, Height, Intensity



Region Tooltips Info



Region Measurements - Results

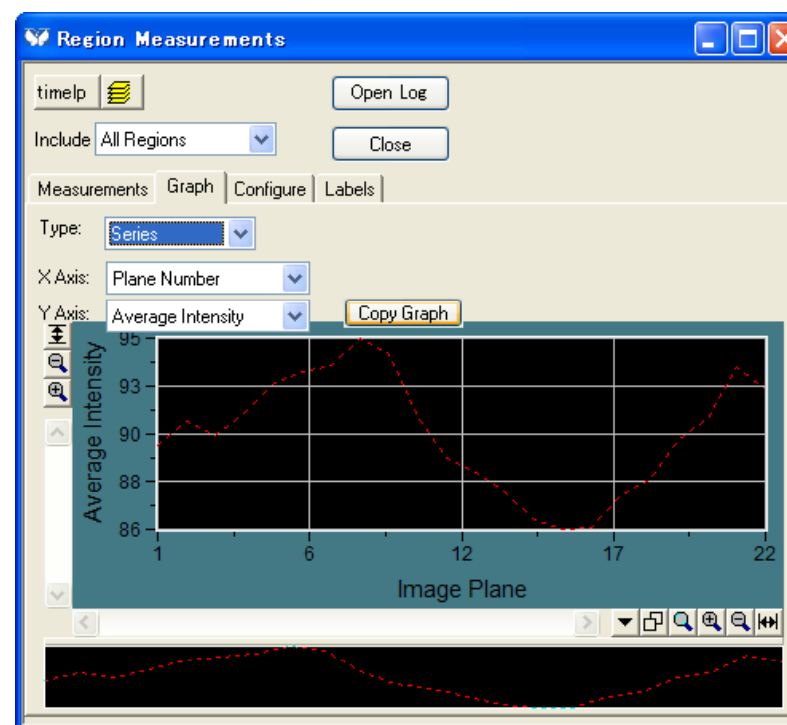
Region Measurements

timelp  Open Log

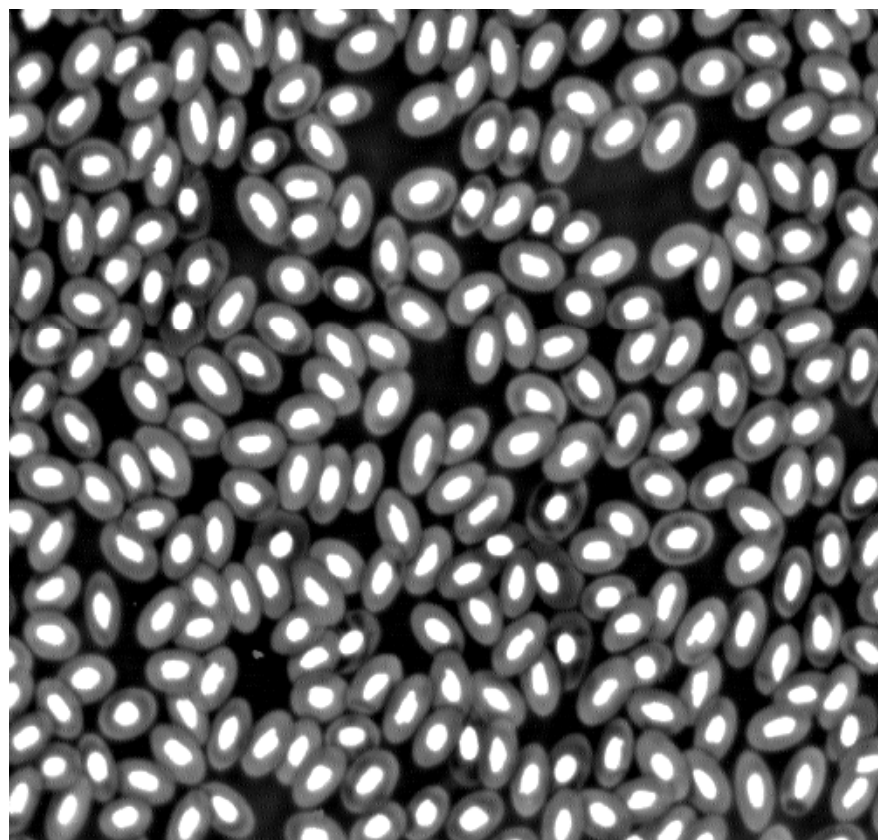
Include: All Regions  Close

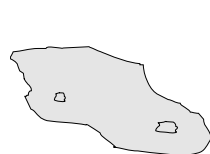
Measurements | Graph | Configure | Labels

Region Label	Image Plane	Average Intensity	Minimum Intensity	Maximum Intensity
1	1	89.8197	8	255
1	2	91.082	12	186
1	3	90.377	10	173
1	4	91.4918	0	185
1	5	93.0656	2	191
1	6	93.6066	4	187
1	7	93.9344	5	185
1	8	95.3115	2	201
1	9	94.5246	8	177
1	10	91.3443	29	145
1	11	89.1803	57	147
1	12	88.4918	59	148
Integrated	-	1989.93	752	3648

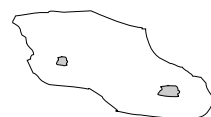


Integrated Morphology Analysis

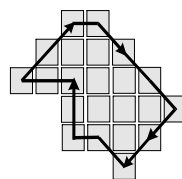




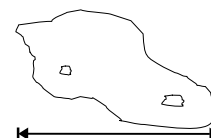
Area



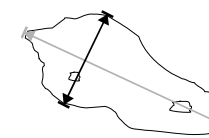
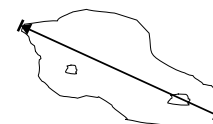
Hole Area



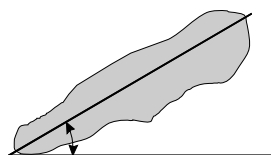
Perimeter



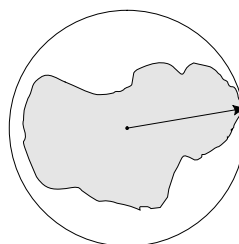
Width and Height



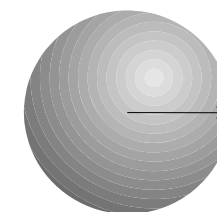
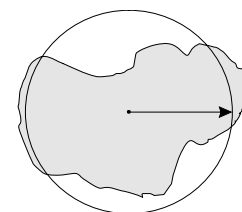
Length and Breadth



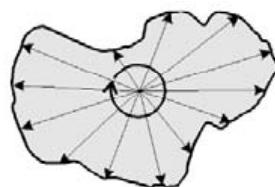
Orientation



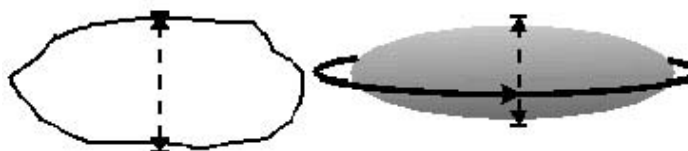
Outer radius



Equivalent sphere volume



Mean Radius



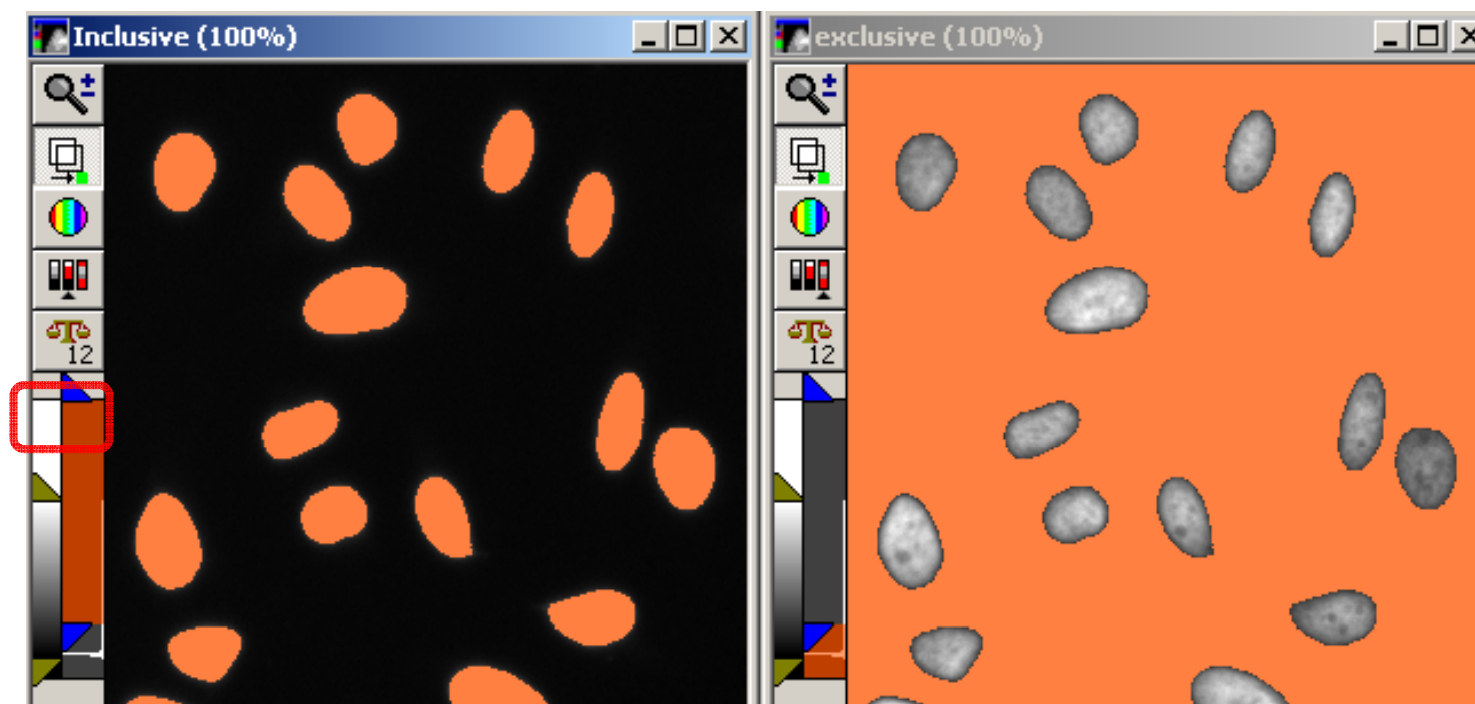
Equivalent Oblate Volume

$$OD = \log_{10} (1/\text{transmittance})$$

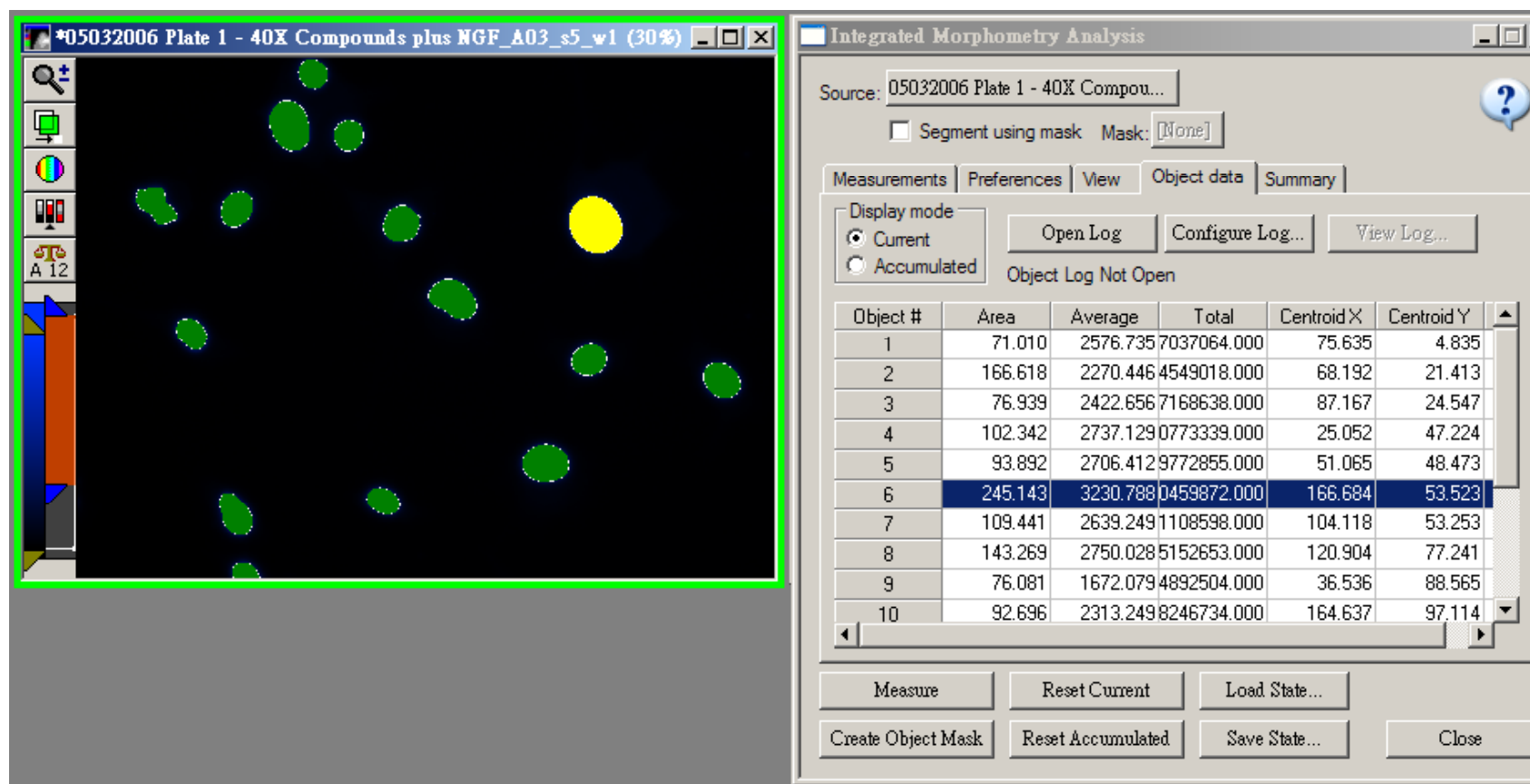
Where $\text{transmittance} = \frac{\text{transmitted light}}{\text{incident light}}$

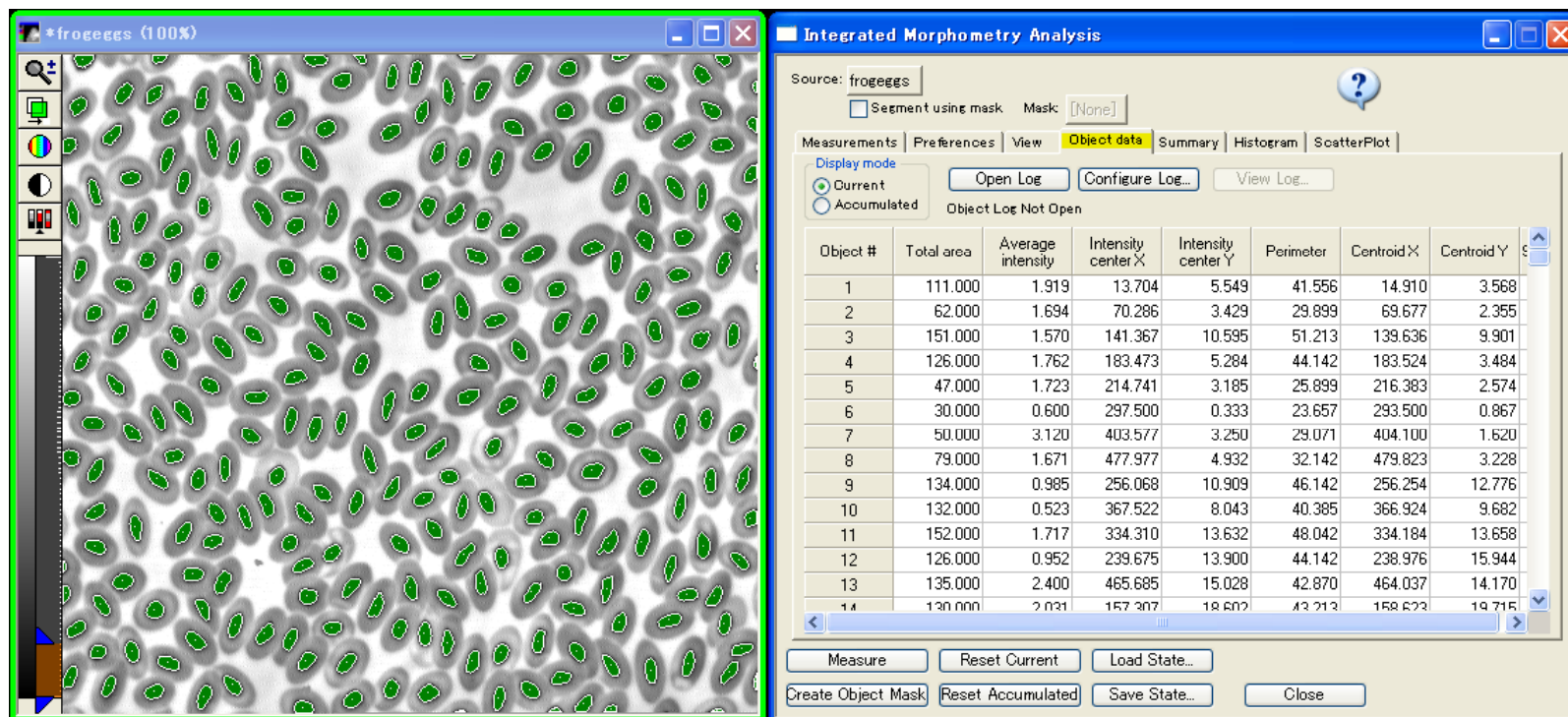
Thresholding

- 以強度篩選欲觀測的區域



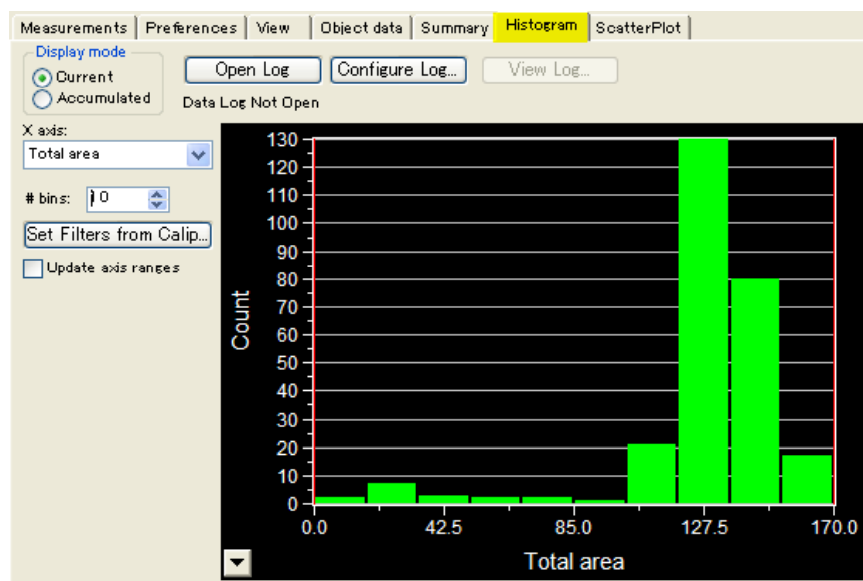
Integrated Morphometry Analysis



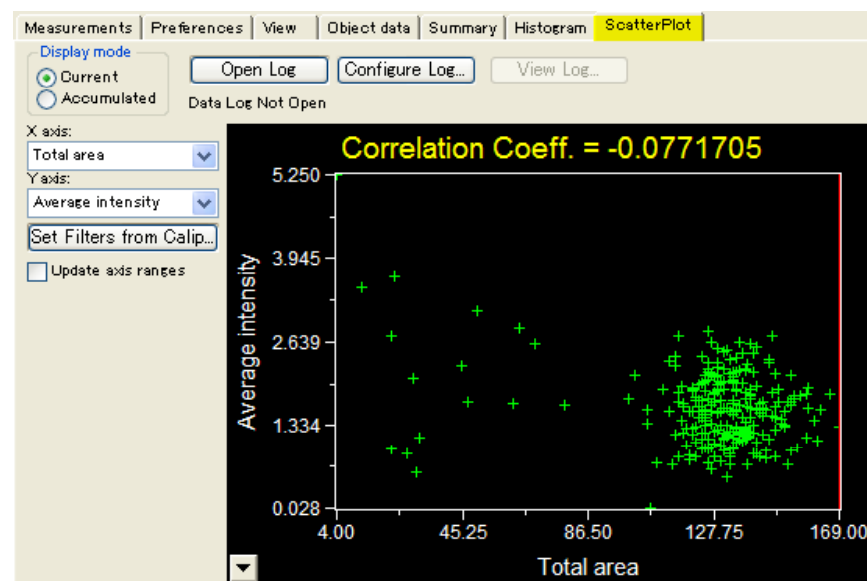


Measurements Preferences View Object data Summary Histogram ScatterPlot								
Display mode ☒ Current ☐ Accumulated Summary Log Not Open								
	Open Log	Configure Log...	View Log...					
Summary	Total area	Average	Intensity	Intensity	Perimeter	Centroid X	Centroid Y	Shap
Count	265	265	265	265	265	265	265	
Average	127.679	1.624	250.789	243.356	42.528	250.607	243.419	
Std. Dev.	25.845	0.591	149.844	142.477	5.960	149.977	142.543	
Minimum	4.000	0.028	1.600	0.333	6.000	0.818	0.867	
Maximum	169.000	5.250	504.000	476.000	55.355	504.000	476.667	
Total	33835.000	430.283	66459.180	64489.387	11269.843	66410.875	64506.039	

Histogram

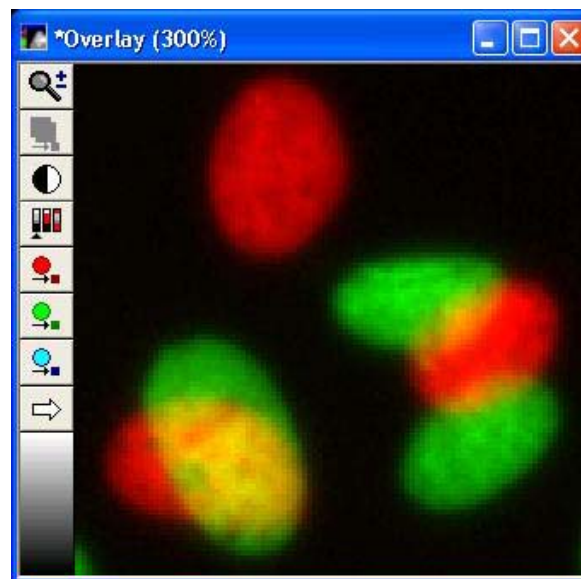
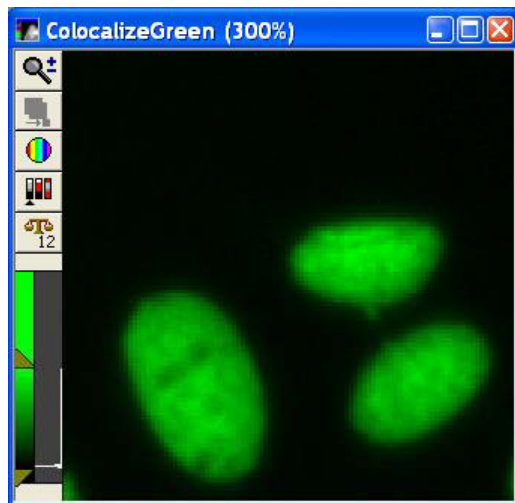
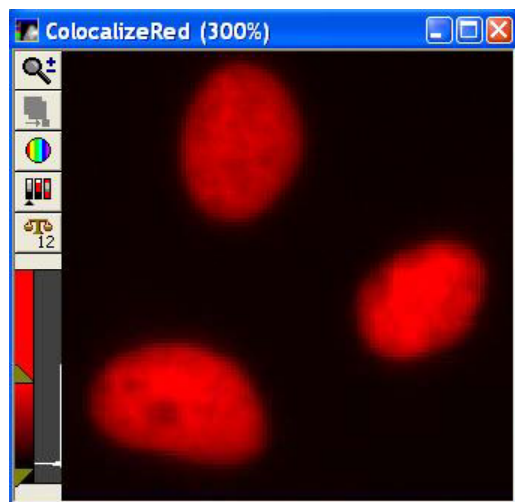


ScatterPlot

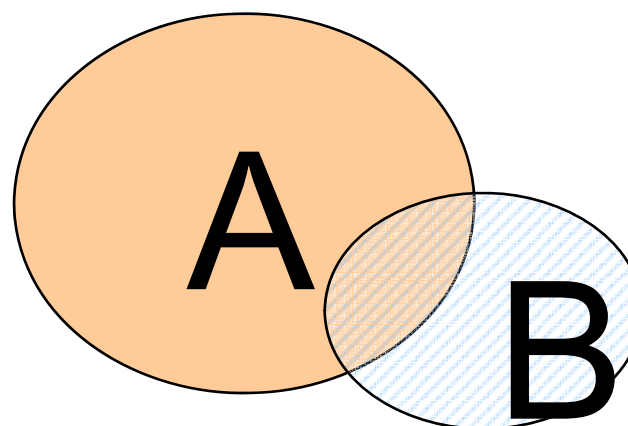
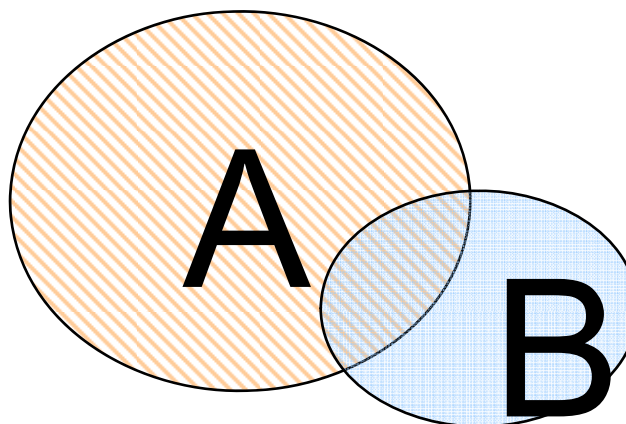
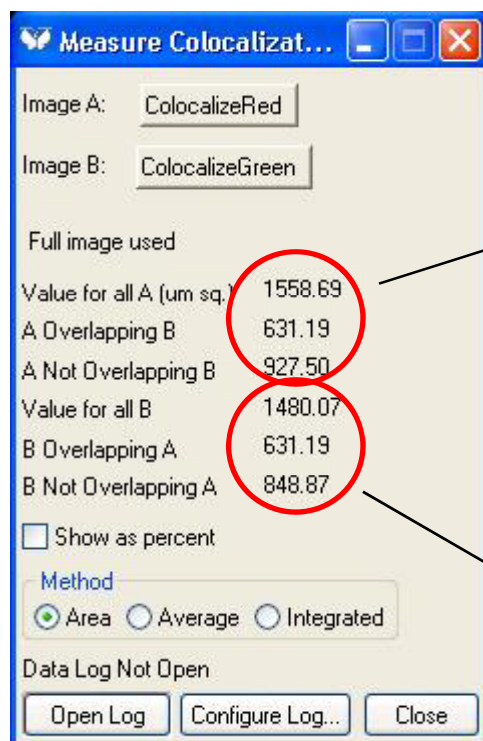


Colocalization

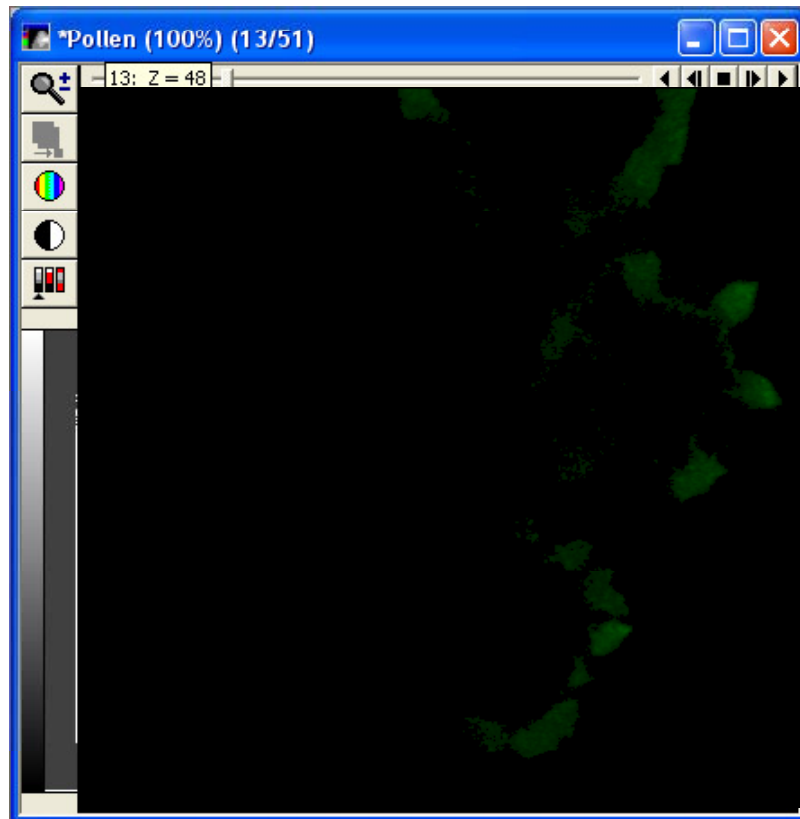
量化2種不同螢光標定重疊程度



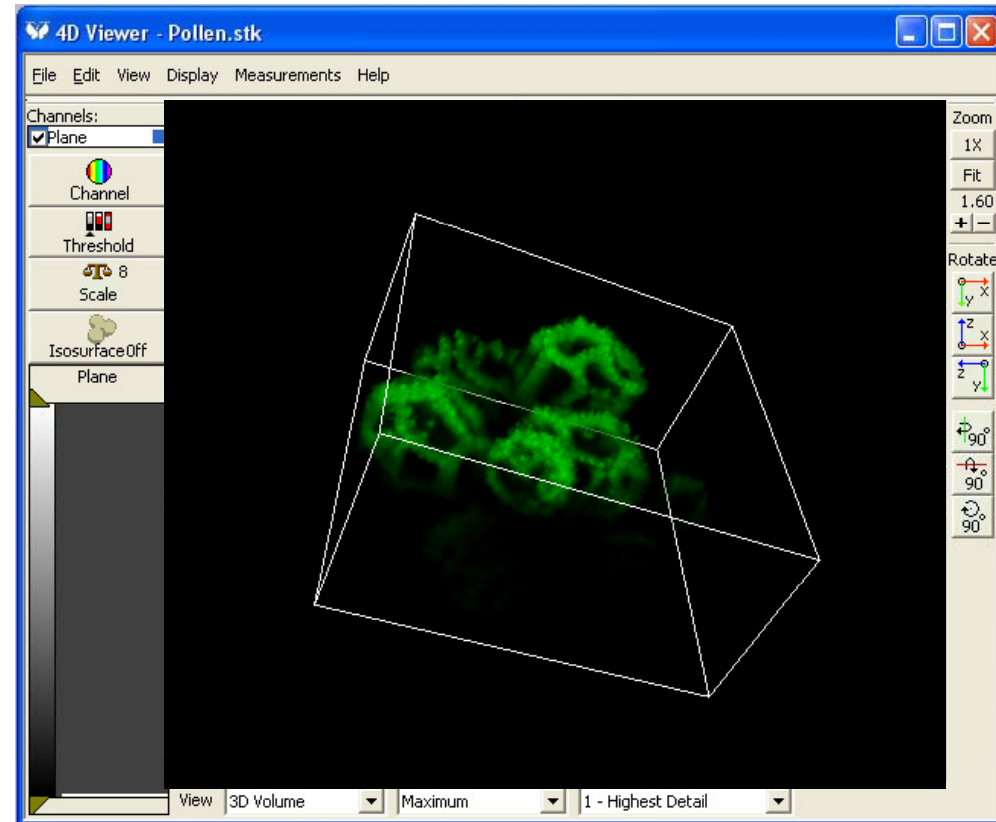
red & green probes colocalized



4D Viewer

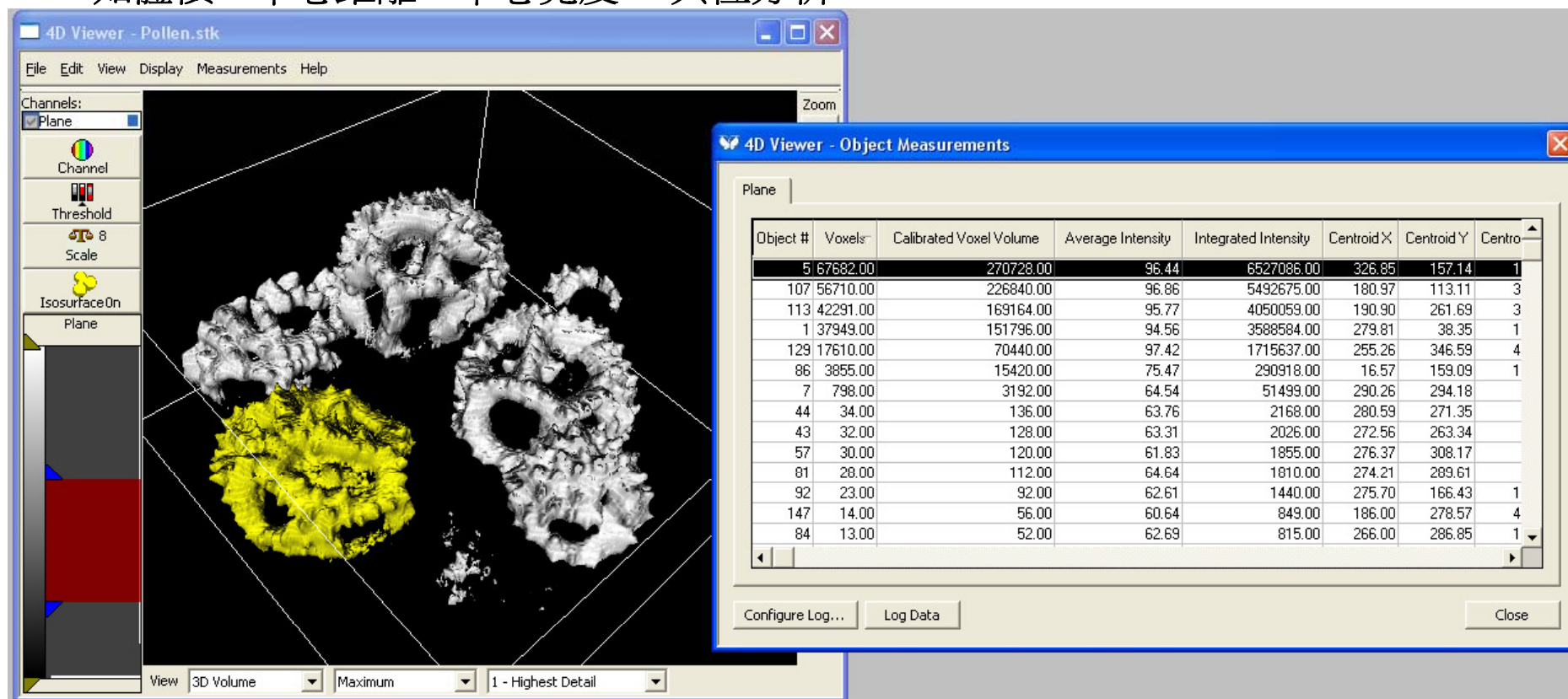


Traditional viewer

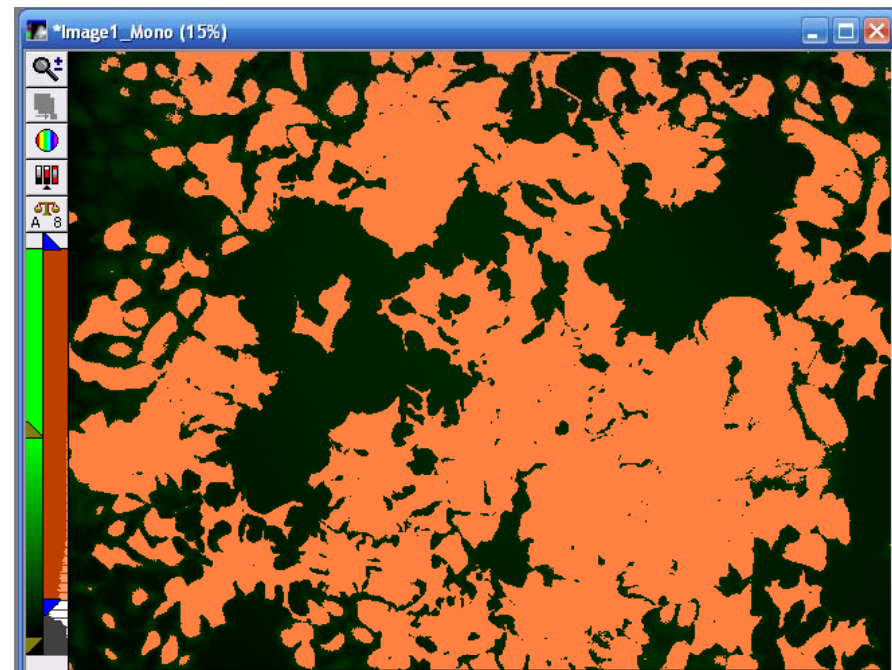
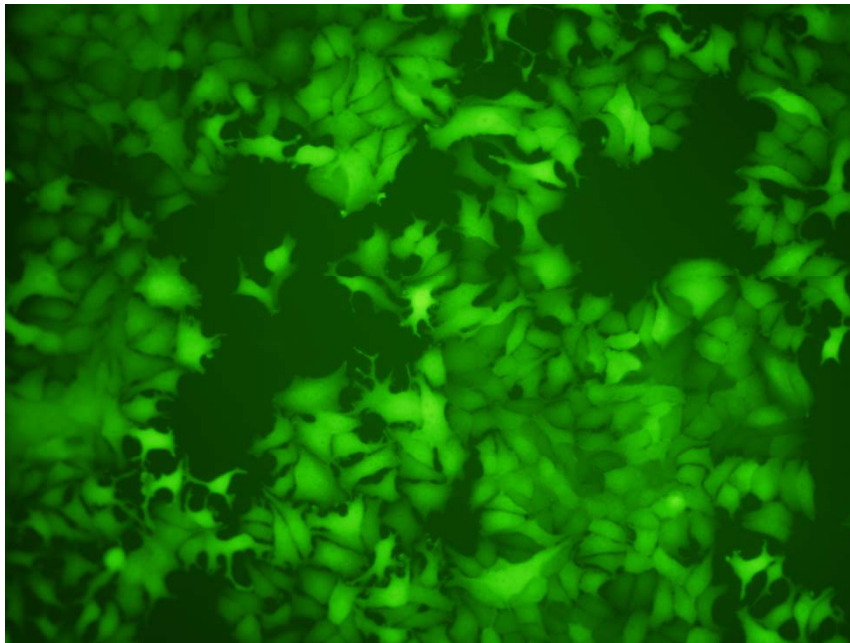


4D viewer

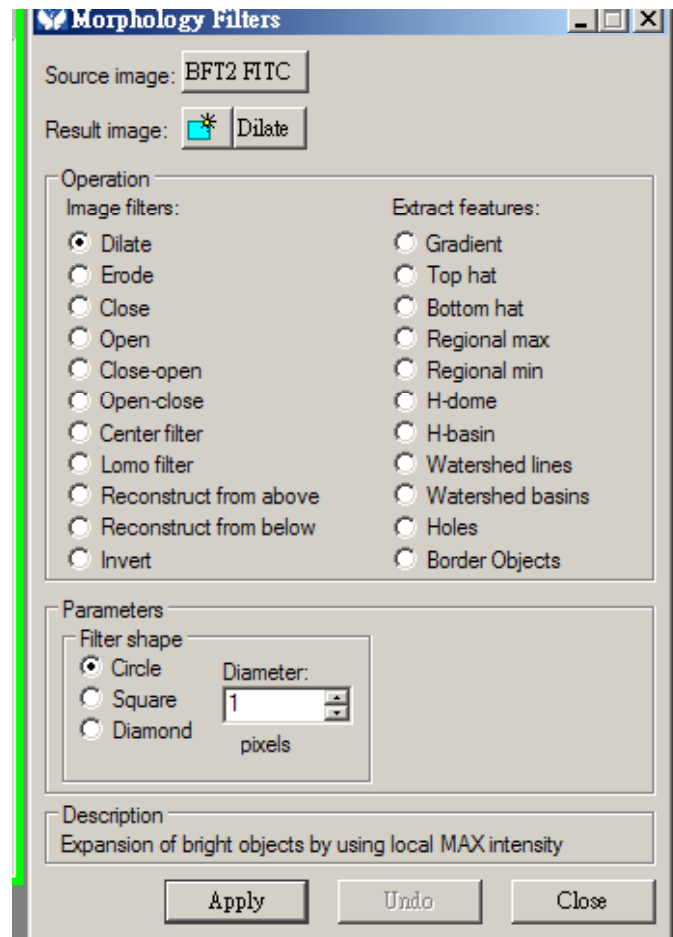
立體空間量測，
如體積、中心距離、中心亮度、共位分析



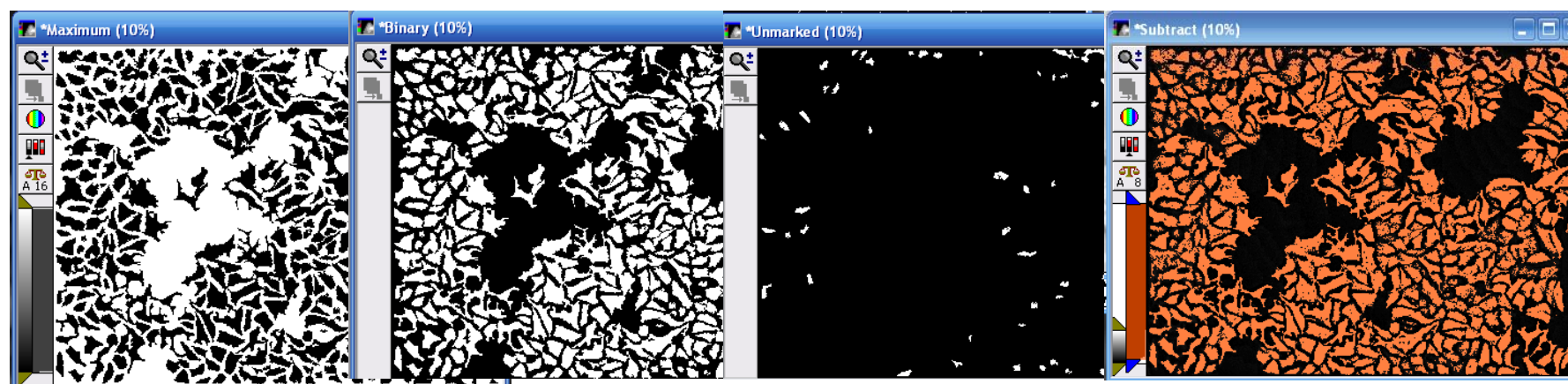
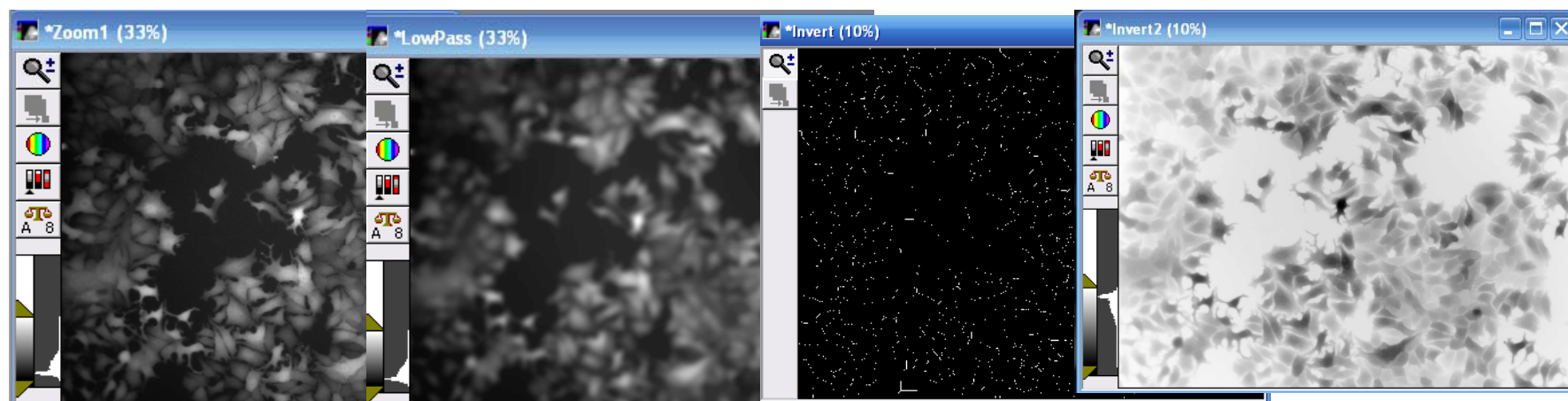
Thresholding is not perfect

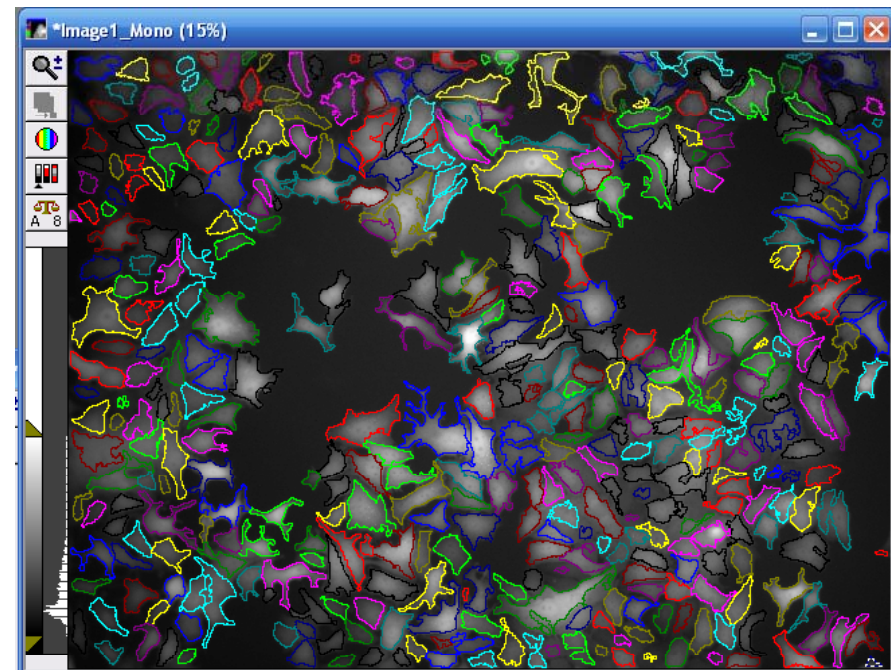
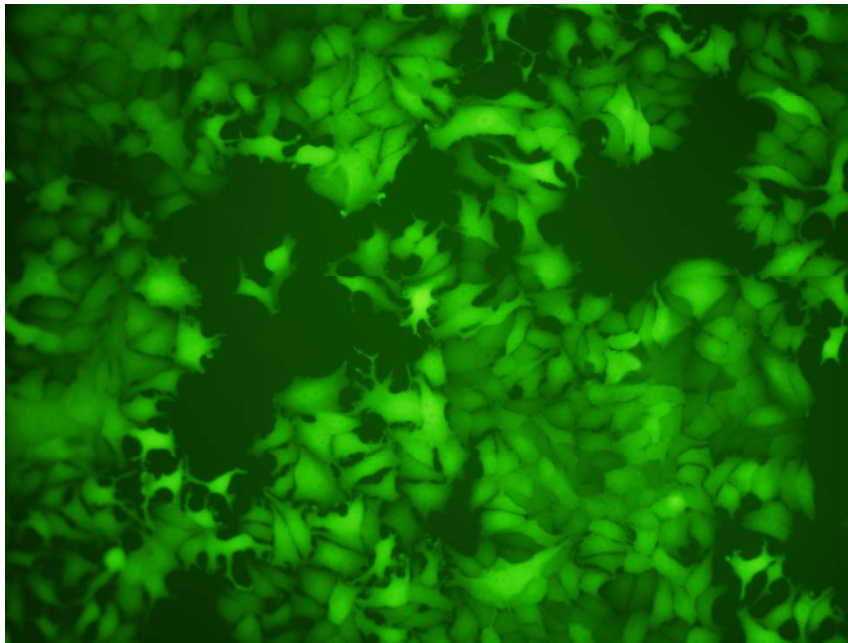


Morphology Filters



- 幫助影像上的物體做出更清楚的呈現
- 濾鏡功能可幫影像上的處理包括:
 - 消除雜訊
 - 降低不均勻的背景
 - 提升影像上要觀測的細微物體並加以顯示
- 沒有單一濾鏡功能適用所有影像修飾,需多做不同處理才可得到最佳影像

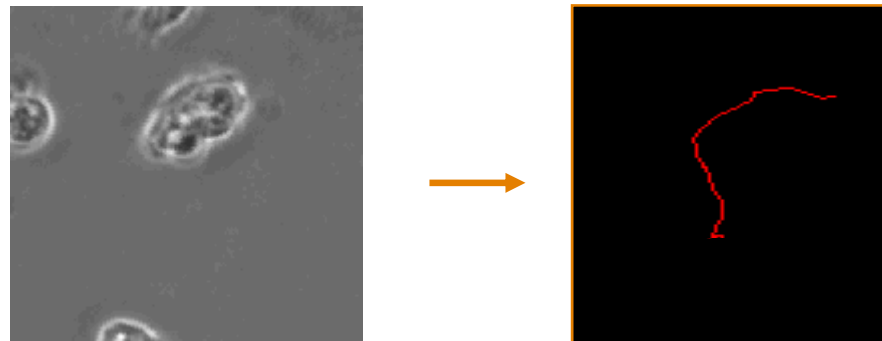
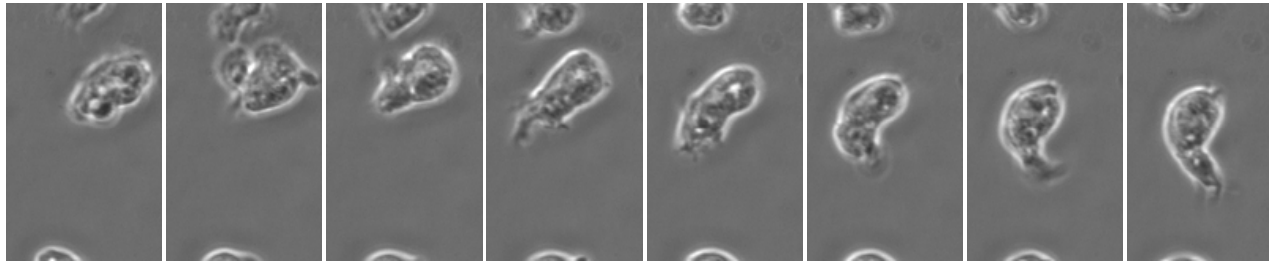




Motion Analysis



Track Objects



Track Objects - Data

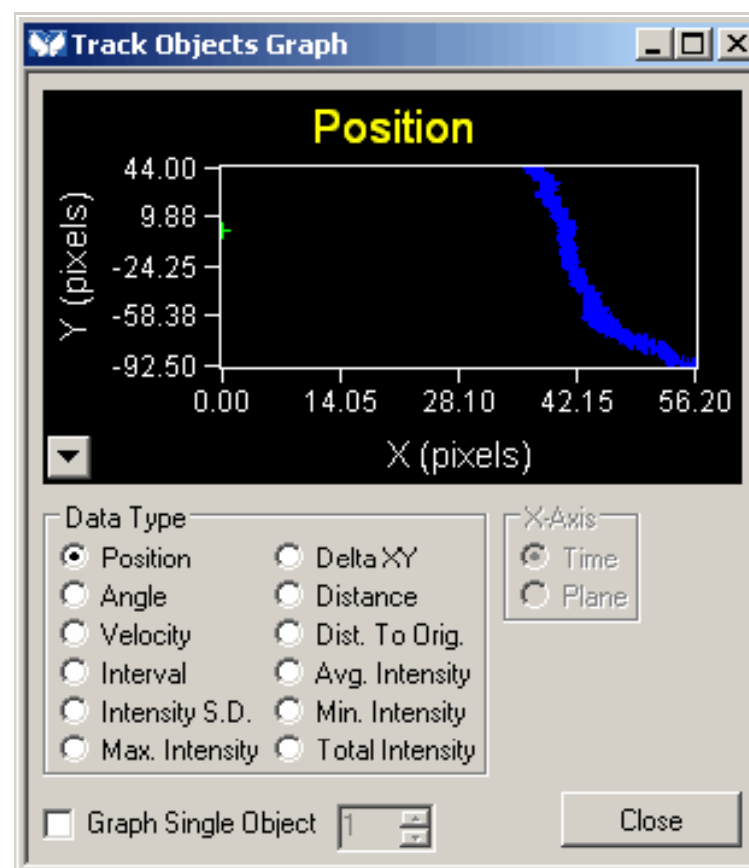
	Object 1	Object 2
Delta XY 1	N/A	N/A
Delta XY 2	(0.000, 0.000)	(-0.625, -1.039)
Delta XY 3	(0.000, 0.000)	(-0.358, -0.651)
Delta XY 4	(0.000, 0.000)	(-0.587, -1.021)
Delta XY 5	(0.000, 0.000)	(-0.098, -0.824)
Delta XY 6	(0.000, 0.000)	(0.446, -0.513)
Delta XY 7	(0.000, 0.000)	(0.119, -0.096)
Delta XY 8	(0.000, 0.000)	(-0.059, -0.718)
Delta XY 9	(0.000, 0.000)	(0.093, -0.900)
Delta XY 10	(0.000, 0.000)	(0.118, -0.702)
Delta XY 11	(0.000, 0.000)	(0.065, -1.009)
Delta XY 12	(0.000, 0.000)	(-0.034, -0.525)
Delta XY 13	(0.000, 0.000)	(-0.036, -0.373)
Delta XY 14	(0.000, 0.000)	(0.095, -0.392)
Delta XY 15	(0.000, 0.000)	(0.894, -0.384)
Delta XY 16	(0.000, 0.000)	(-0.225, -0.514)
Delta XY 17	(0.000, 0.000)	(0.237, -0.539)
Delta XY 18	(0.000, 0.000)	(-0.107, -0.327)
Delta XY 19	(0.000, 0.000)	(-0.035, -0.530)
Delta XY 20	(0.000, 0.000)	(-0.000, -0.781)

Data Type

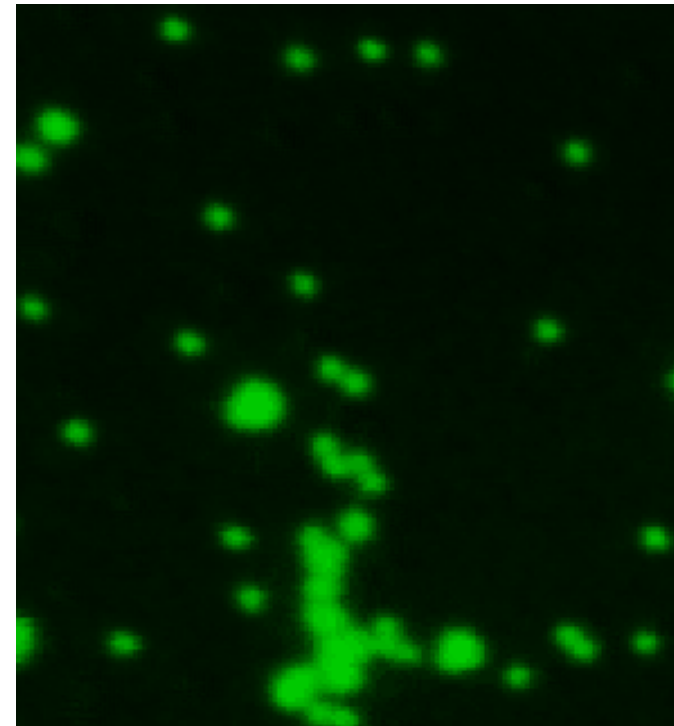
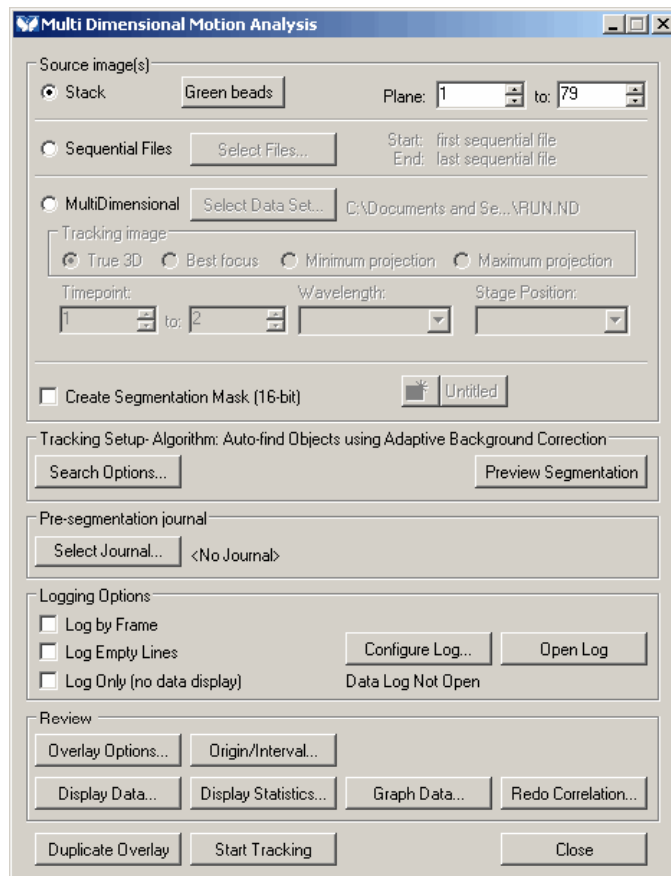
☐ Position ☒ Delta XY
☐ Angle ☐ Distance
☐ Velocity ☐ Dist. To Orig.
☐ Interval ☐ Avg. Intensity
☐ Intensity S.D. ☐ Min. Intensity
☐ Max. Intensity ☐ Total Intensity

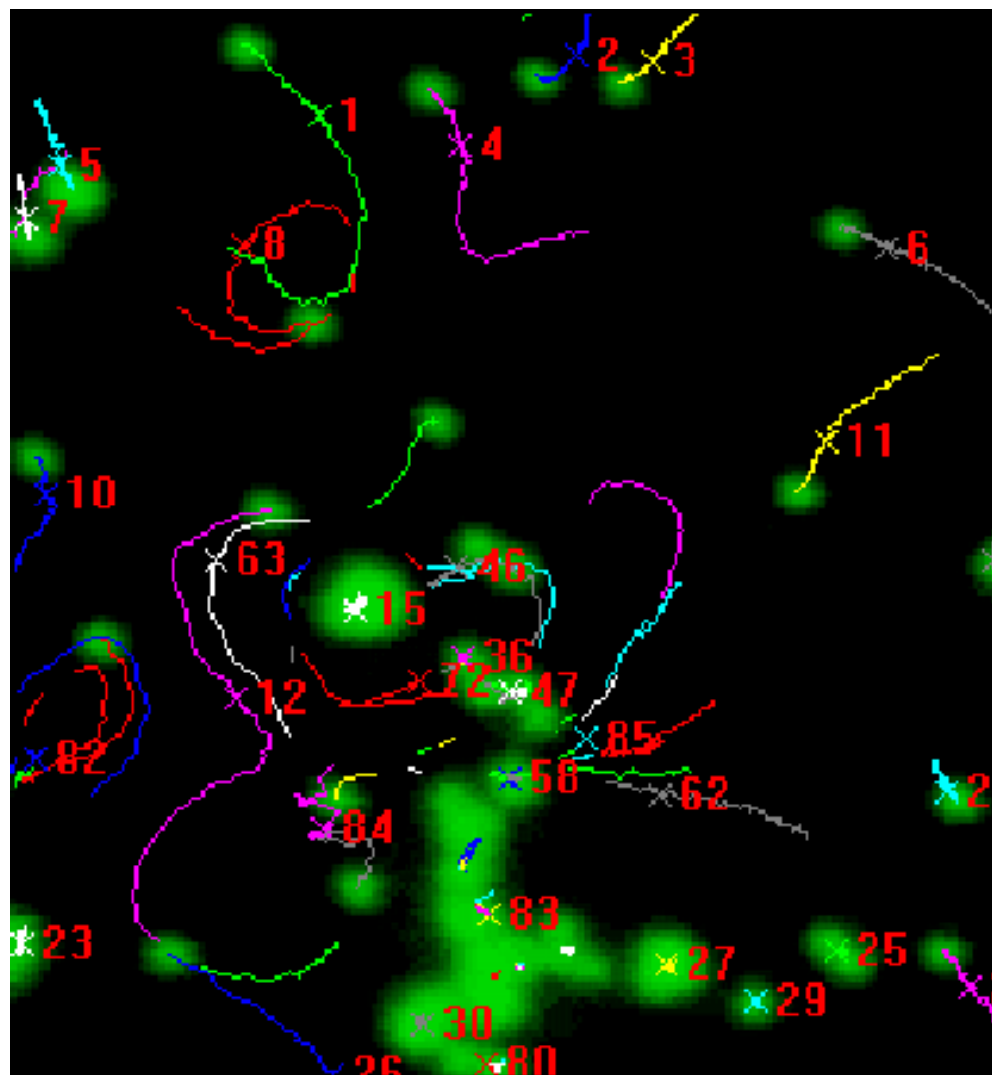
Print Table

Close

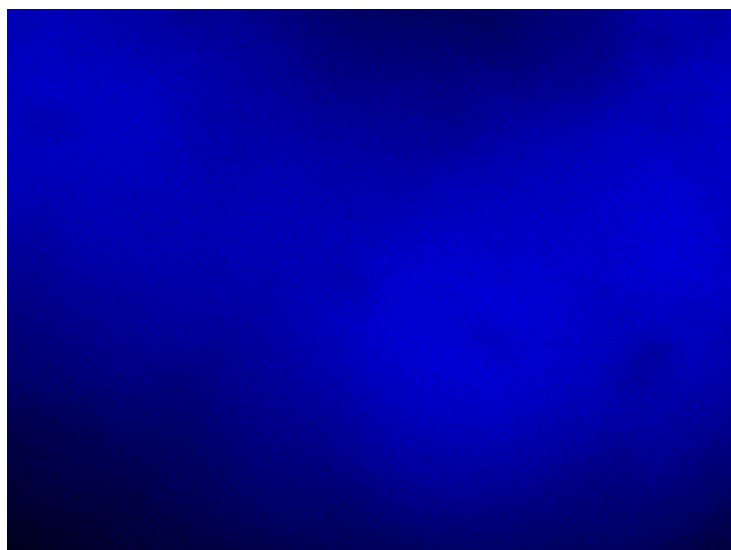


Multi Dimensional Motion Analysis

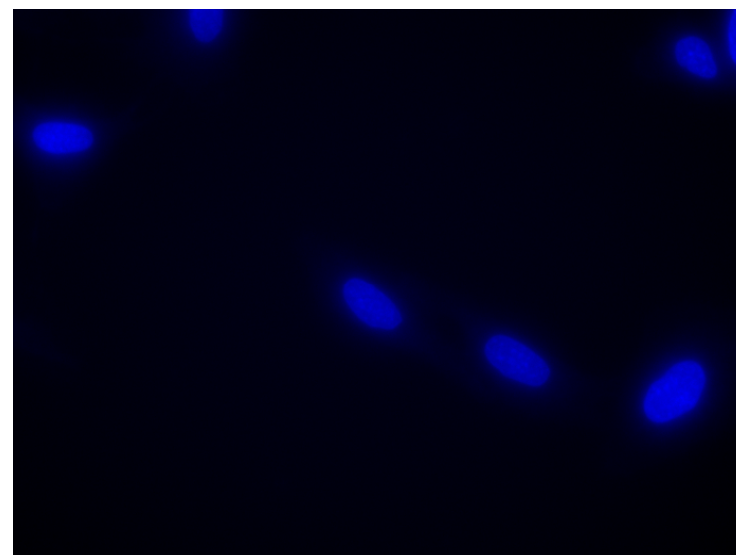




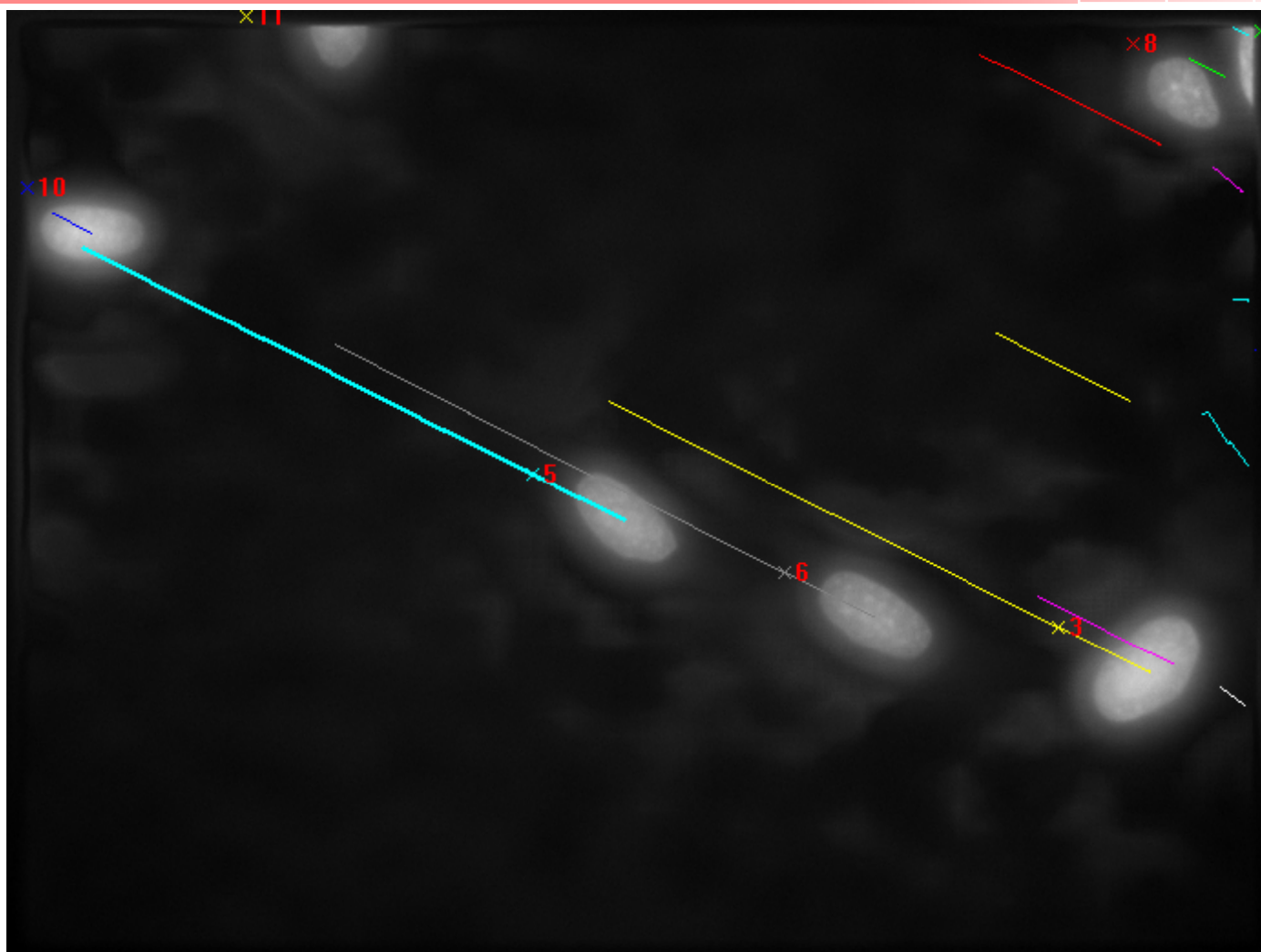
11 z planes



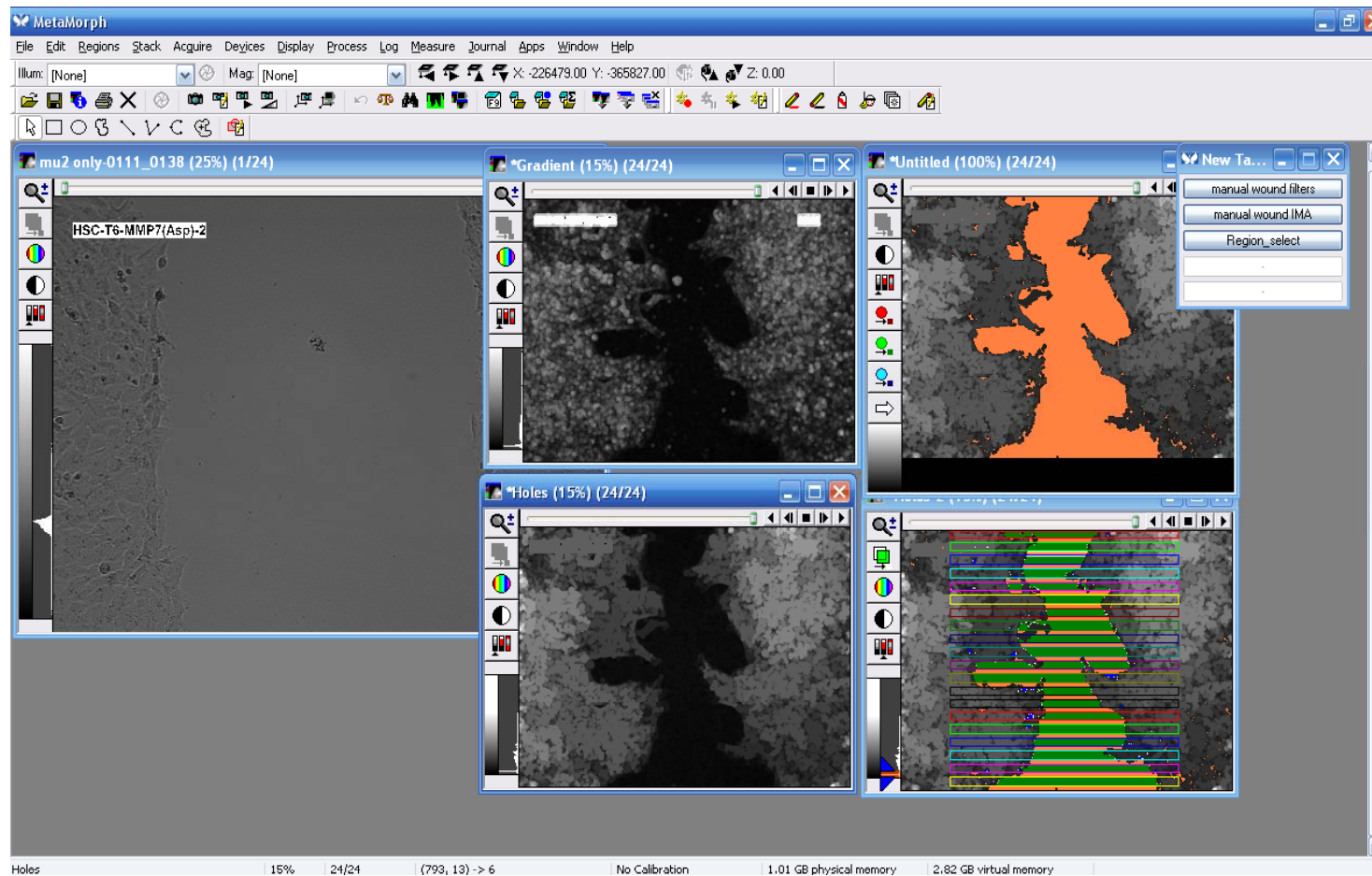
31 time points



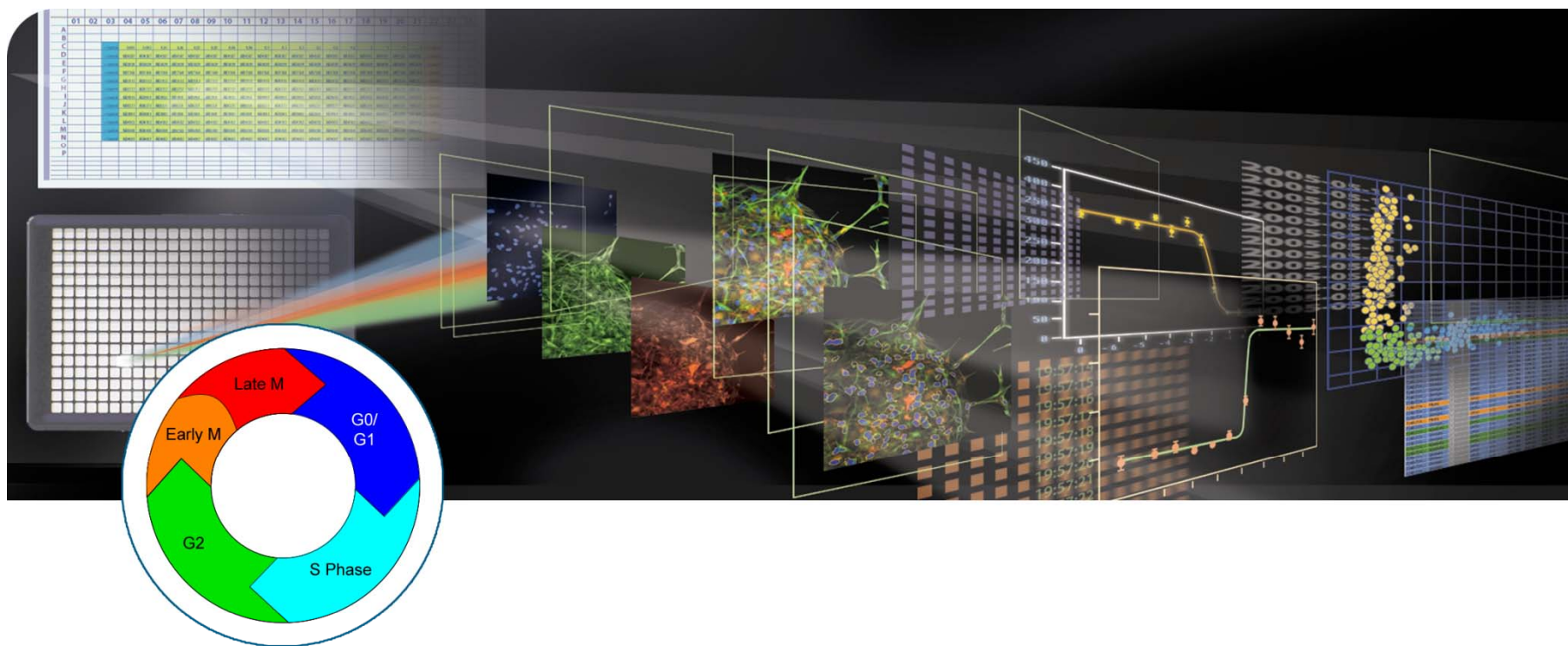
341 images



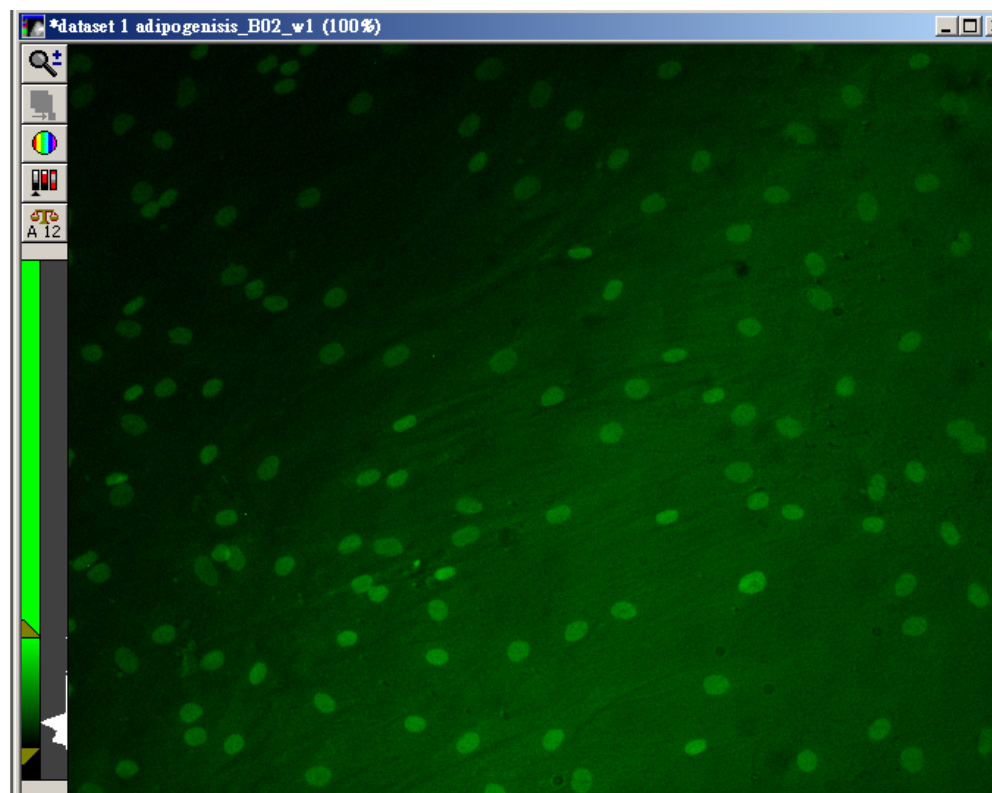
Journal

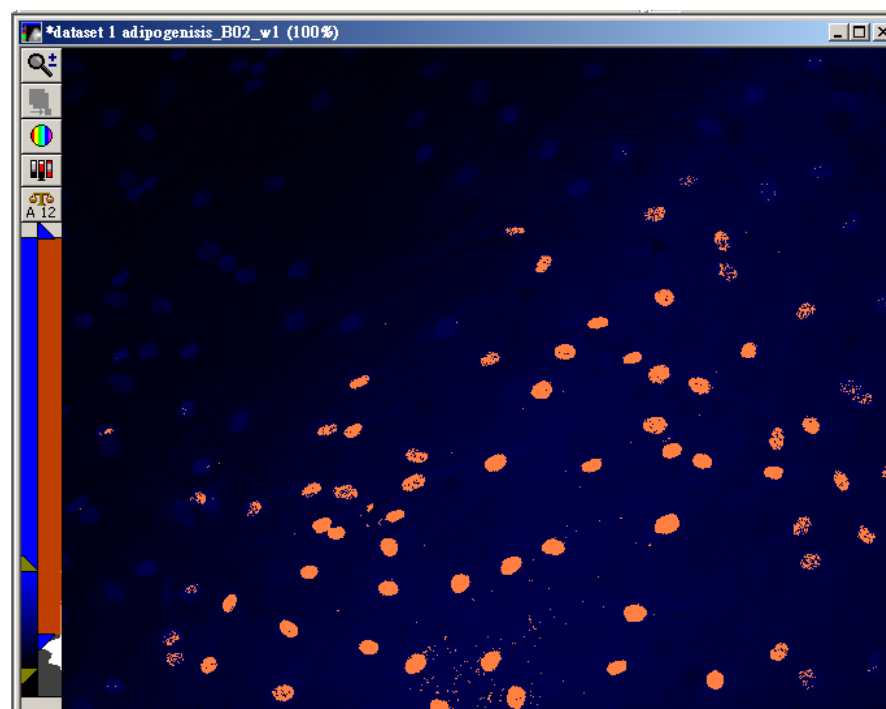
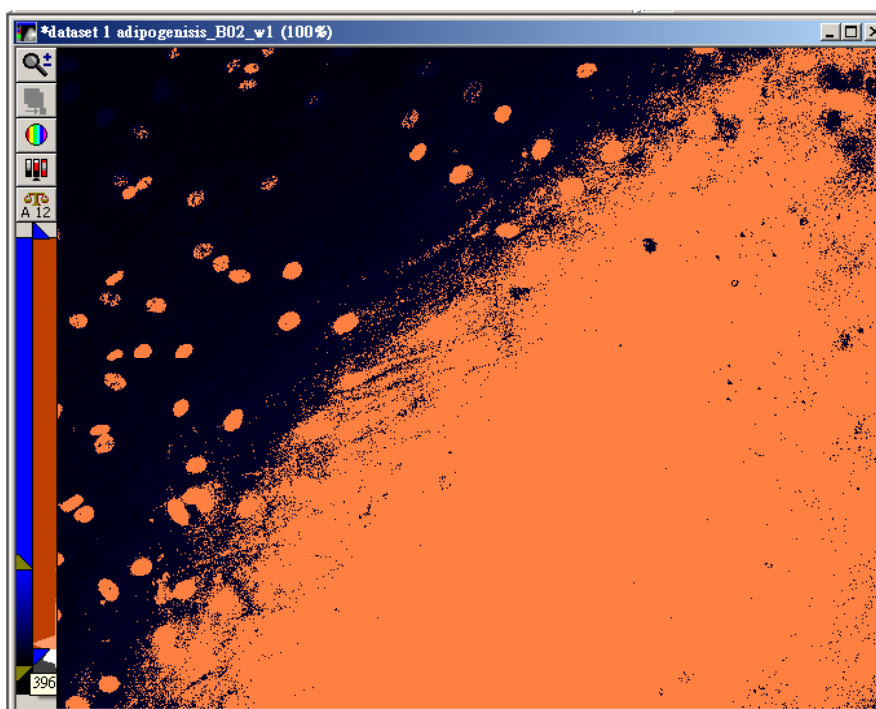


Application Modules

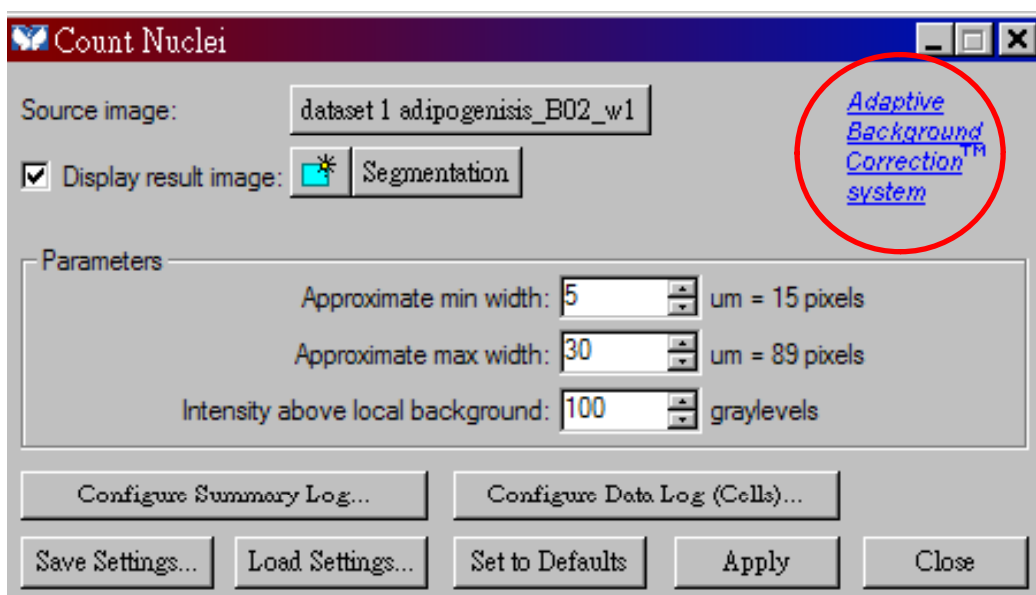


Count Nuclei



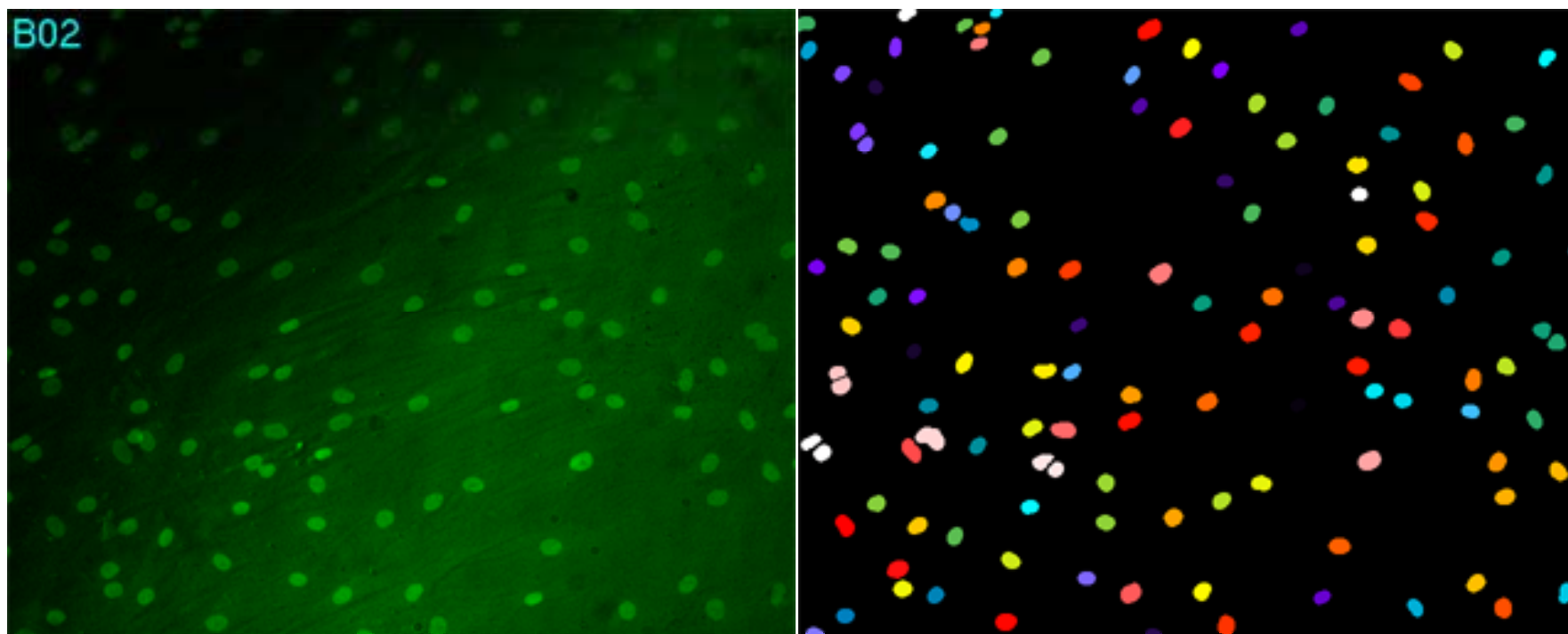


Ease of Use: “Canned” Modules



- 可區隔相連的細胞
- 可消除背景不均勻的影響

Count Nuclei Results

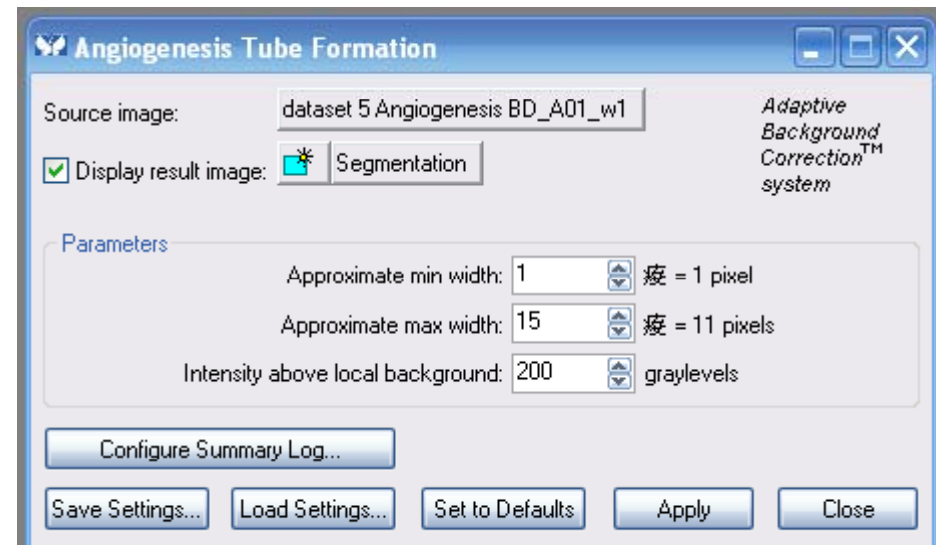
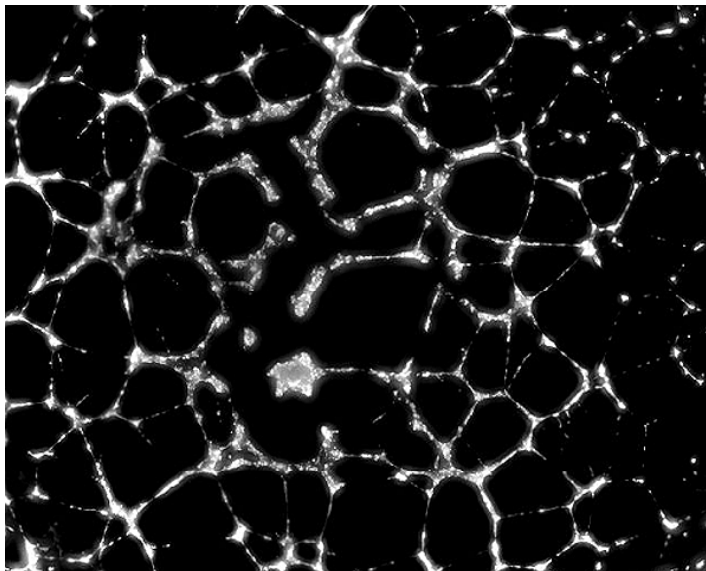


Angiogenesis Tube Formation

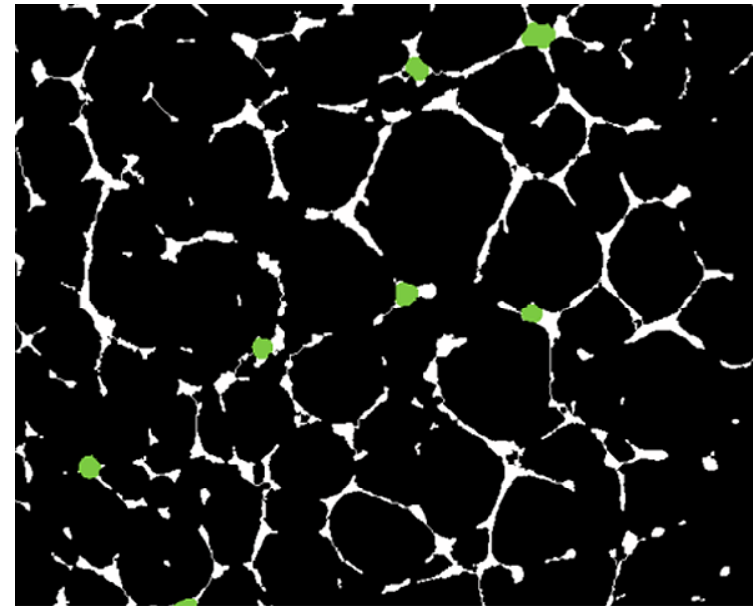
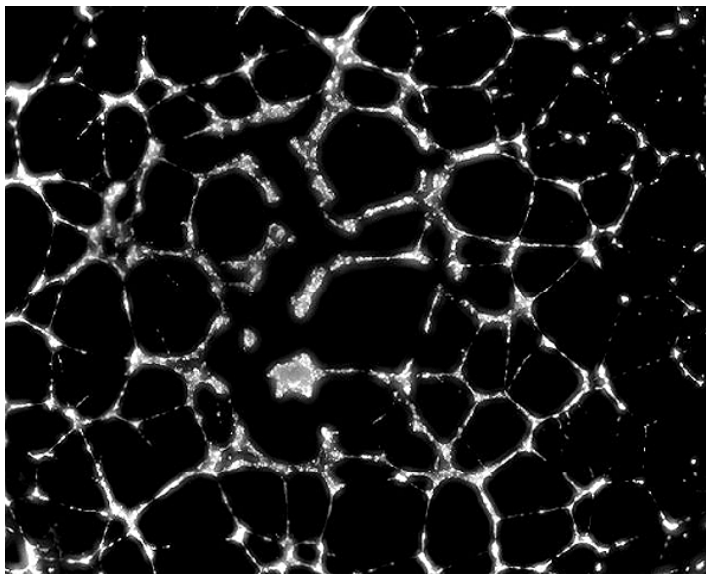
用途

- 主要是拿來量測 endothelial tube formation
- 此類研究著眼於血管形成之加速或抑制。
- 有現成的染劑套件可以使用。
- 有一些已成功的研究，如 Genentech's Avastin which blocks VEGF activity

Angiogenesis Results



Angiogenesis Results



Left: from stack, a **best focus** image is obtained. **Right:** analysis. White: tubes, green: nodes. BD BioCoat™ Angiogenesis System: Angiogenesis Endothelial Cell Tube Formation Assay. Courtesy of Min Wu, BD Biosciences.

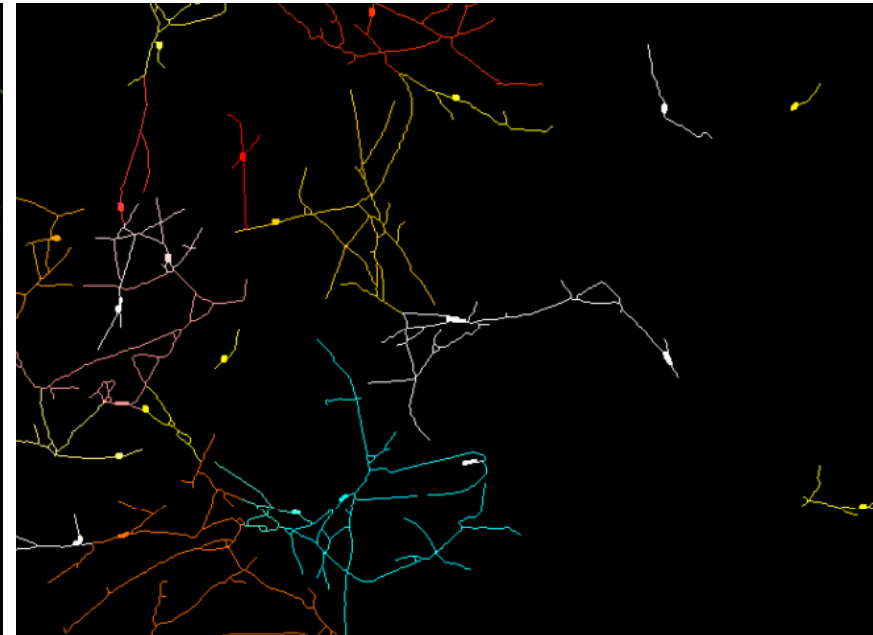
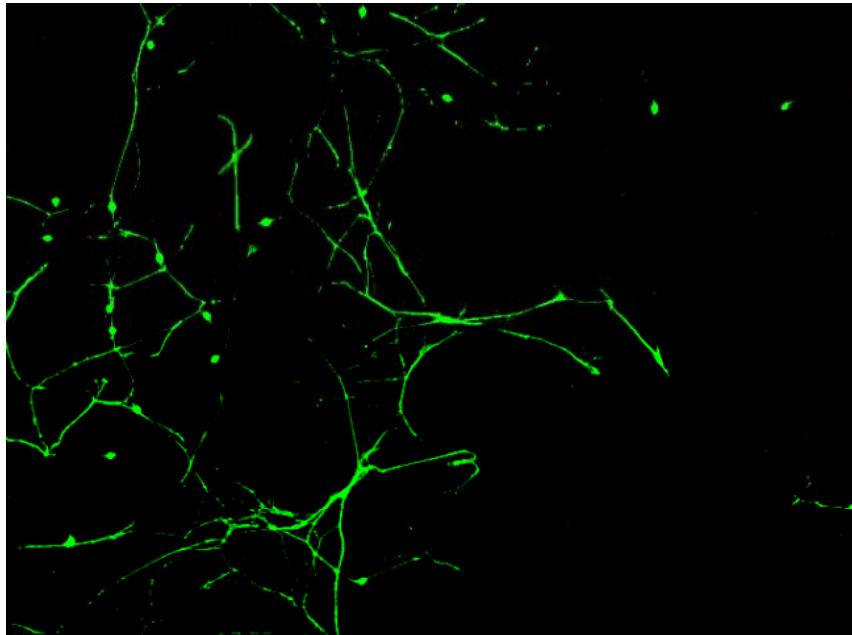
Neurite Outgrowth Application Module



用途

- 量測分支數量及長度
- 可使用在
 - 神經元退化，如 Alzheimer's and Parkinson's
 - 神經細胞修復: Spinal Cord Repair
 - 細胞分化 (Stem Cell Research)

Neurite Outgrowth Results



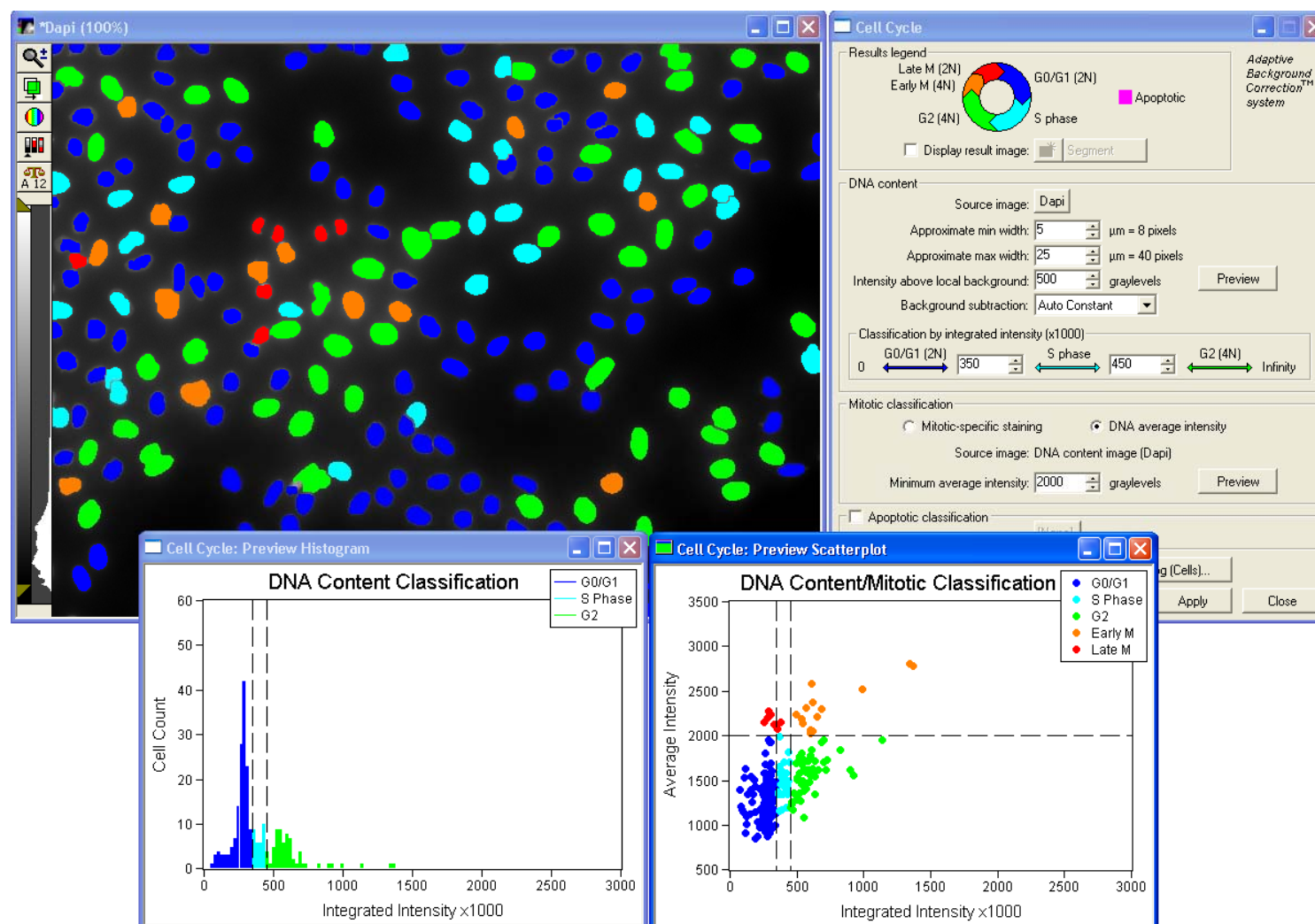
Left: image acquisition. Right: Each filament is assigned to a cell body. All the filaments and cell bodies are then measured. Images courtesy of Kris Poulsen and Davide Foletti, Rinat Neuroscience Corporation.

Cell Cycle Application Module

特性

- 結果資料和分類是以互動式彩色曲線圖表示。
- 簡單易用的分析設定Flexible configuration
 - Single wavelength mode:
減數分裂的5個時期是利用核染色所獲得的DNA組成與平均亮度來分類
 - 可使用一些對有絲分裂有專一性的染色套件。
 - 可使用一些細胞凋亡的染色套件 (6th cell classification)

Cell Cycle Results



Cell Health Application Module

三種波長的分析

- 核染色，細胞凋亡染色，死細胞染色

用途

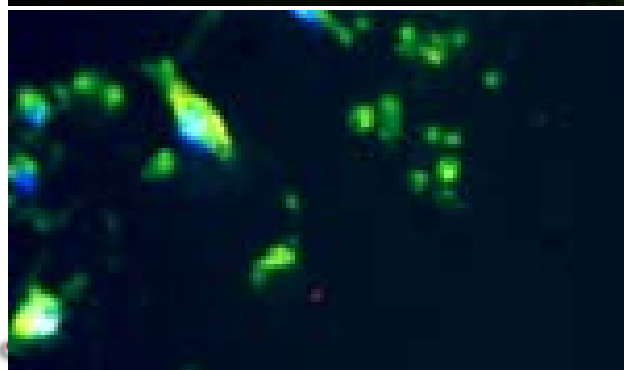
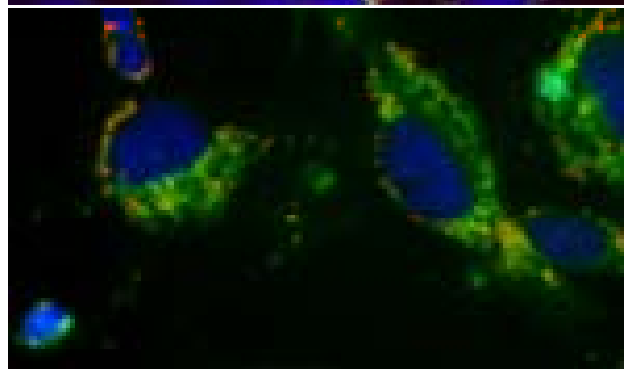
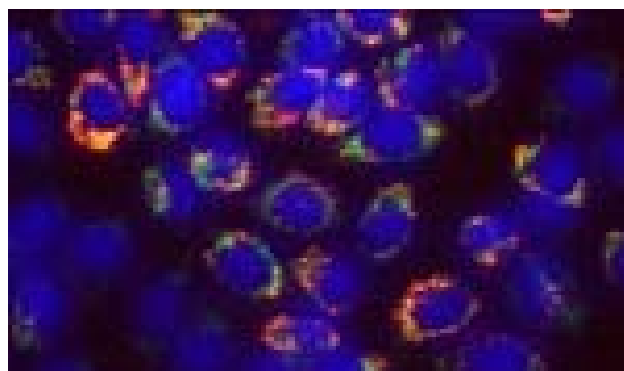
- 細胞凋亡

將細胞區分成四類：正常，細胞凋亡初期，細胞凋亡後期，壞死的細胞

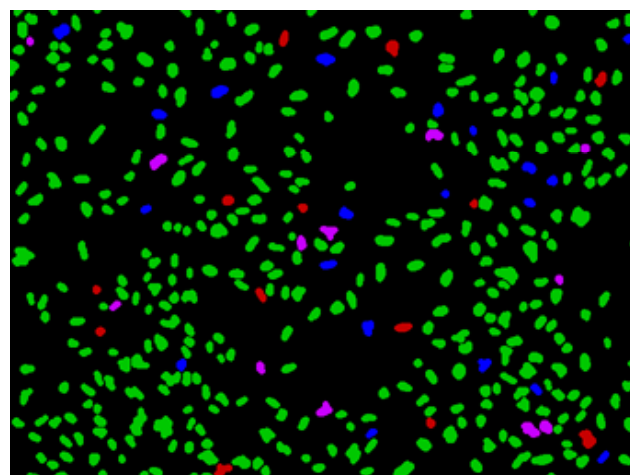
可使用一些流式細胞儀常用的染劑套件

1. Vybrant #7 from Molecular Probes
2. Annexin V
3. JC-1 with Hoechst: used to study loss of mitochondrial potential

Cell Health Results



Adherent Chinese Hamster Ovary (CHO-K1) cells were incubated with various concentrations of staurosporine. From top to bottom: control, 0.1 μM staurosporine, and 3 μM staurosporine. BIOMOL International's Mit-E-Y Mitochondrial Permeability Detection (Hoechst 33342 + JC-1). Courtesy of BIOMOL International.



Cells analyzed by the module. Green: viable, blue: early apoptotic, purple: late apoptotic, red: necrotic.

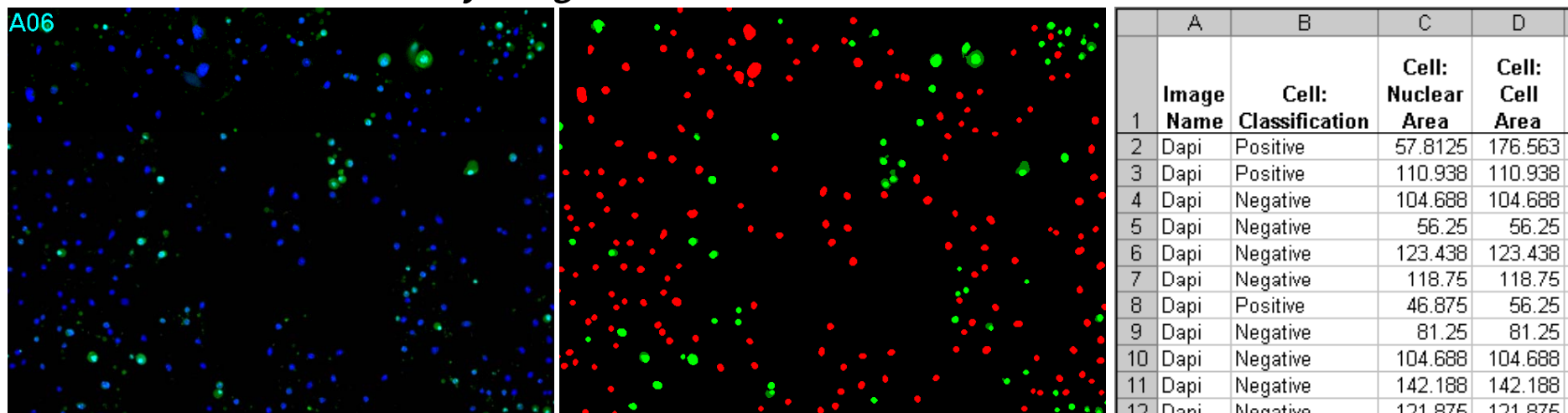


Major Instruments Co., Ltd.

Cell Scoring

用途: 兩種波長

- 可以用第二種螢光染劑將特定的細胞區分出來
- Probe 1: nuclear marker
- Probe 2: *anything*

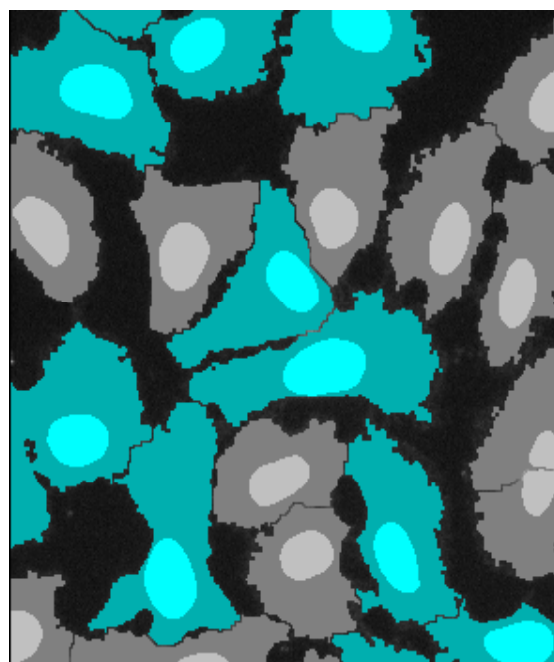


Left: Acquired image, two wavelengths overlay. **Center:** Analyzed image shows the identification of two probes. **Right:** Data collected can be exported to a spreadsheet program for further analysis.

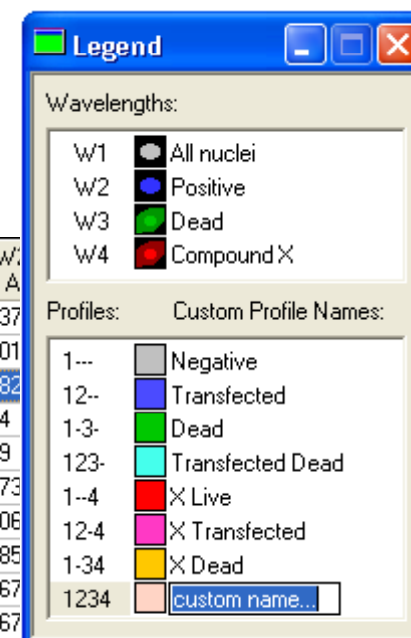
Multi Wavelength Cell Scoring

用途

- *Your research*— 不需要寫程式或其他巨集就可設計多樣化的模組
- 可使用1到7種不同的波長
- 分析結果可針對每一個細胞及每一個波長



Cell: Custom Profile Name	Cell: Total Area	Cell: W1 Stained Area	Cell: W1 Area	Cell: W2 Stained Area	Cell: W2 Area
Negative	1685.37	180.549	1685.37		
Transfected	3627.01	426.621	3627.01		
Transfected	2920.82	433.173	2920.82		
Transfected	4011.4	769.519	4011.4		
Transfected	2992.9	208.942	2992.9		
Transfected	3627.73	535.096	3627.73		
Transfected	3418.06	540.92	3418.06		
Negative	2323.85	546.016	2323.85		
Negative	1708.67	475.398	1708.67		
Transfected	3033.67	584.602	3033.67		
Negative	1887.03	394.588	1887.03	422.841	
Negative	1815.69	422.253	1815.69	401.123	
Negative	2476.73	421.525	2476.73	377.003	
Negative	2363.89	428.077	2363.89	389.5	





Thank You