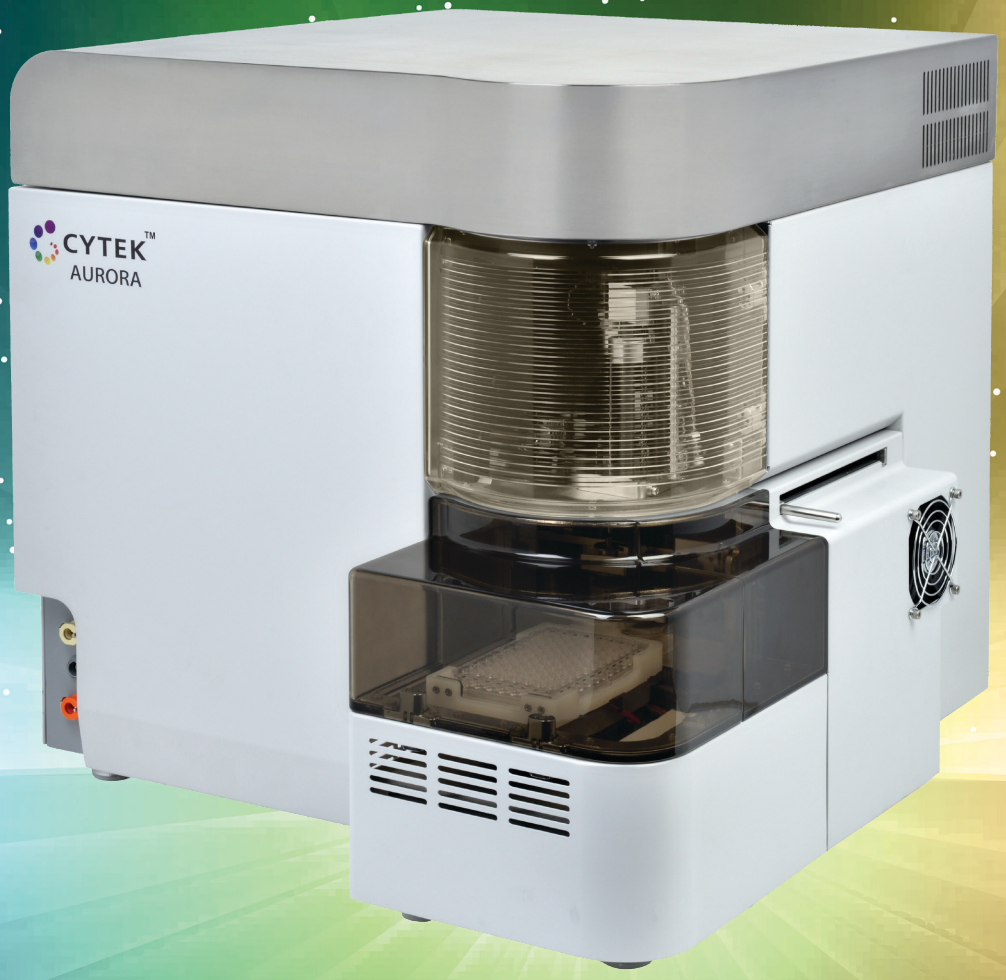
CYTEK

TRANSCEND THE CONVENTIONAL



Cytek® Aurora

Say Hello to a New Reality

Meet Aurora:

A prodigy incorporating a unique combination of patent-pending innovative technologies that takes flow cytometry to the next level of performance and flexibility.

With up to five lasers, three scattering channels, and 64 fluorescence channels, the Aurora suits every laboratory's needs, from simple to high-complexity applications. A paradigm shifting optical design provides unprecedented flexibility, enabling the use of a wide array of new fluorochrome combinations without reconfiguring your system for each application. The state-of-the-art optics and low-noise electronics provide excellent sensitivity and resolution. Flat-top laser beam profiles, combined with a uniquely designed fluidics system, translate to outstanding performance at high sample flow rates.

The end result is a system that delivers high quality data where rare and dim populations are easily resolved, regardless of assay complexity.

SpectroFlo® software offers an intuitive workflow from QC to data analysis with technology-enabling tools that simplify running any application.

The Cytek team has reimagined every aspect of cytometry hardware and software to deliver an instrument that fulfills every scientist's needs.

Maximum Channels

64 fluorescence channels of detection over the full emission spectra.

Maximum Colors

Beyond 30 colors demonstrated including fluorochromes with emission spectra in close proximity to each other.

Maximum Sensitivity

Sensitivity redefined using state-of-the-art optics and low-noise electronics.

Maximum Flexibility

No changing optical filters for any fluorochrome.

Use any commercially available fluorochrome excited by the onboard lasers.

Maximum Accessibility

A powerful, high value system that is accessible to a wide range of users.

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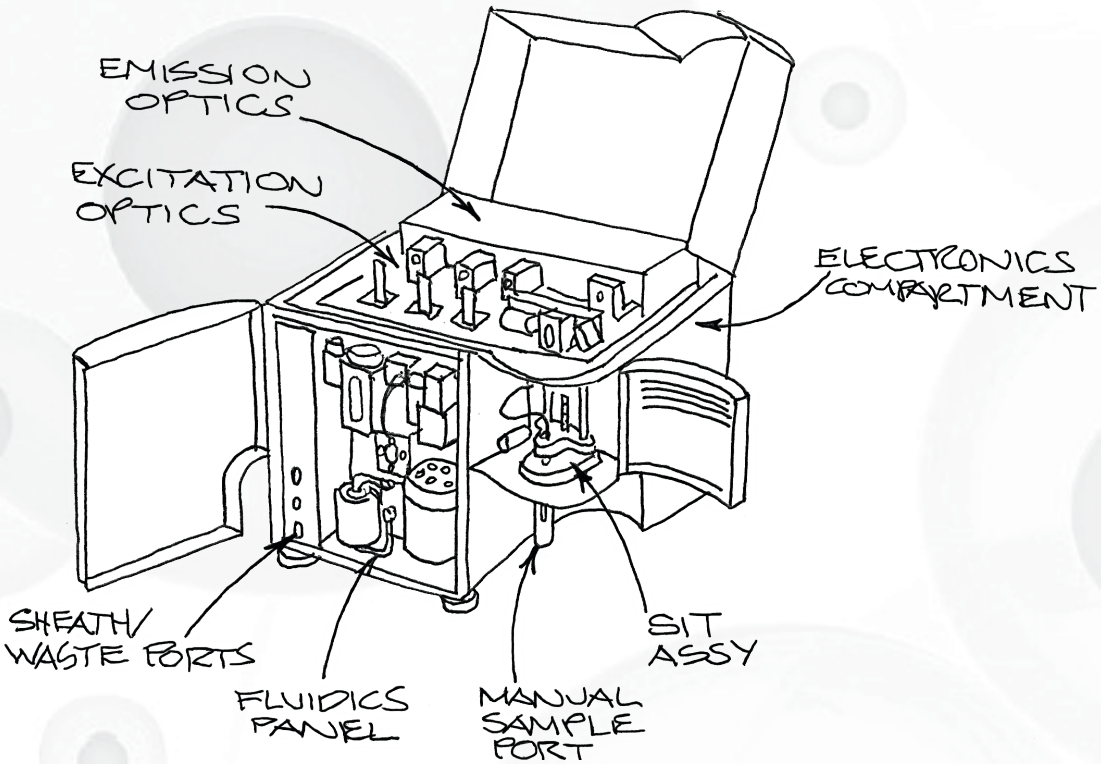
Aurora's Revolutionary Technologies:
From Vision to Reality

The Aurora is capable of up to 67 detection channels (64 fluorescence channels, FSC, blue laser SSC, and violet laser SSC) and is empowered by revolutionary technologies, including:

- Proprietary high sensitivity Coarse Wavelength Division Multiplexing (CWDM) semiconductor detector arrays, enabling more efficient spectrum capture for dyes emitting in the 365-829 nm range.
- High bandwidth electronics design scalable up to 67 channels.
- Robust vacuum fluidics system enables ultimate flexibility in sample input formats.
- Exceptional small particle detection is enabled by violet laser scatter, narrow beam height, and proprietary flat top laser design.



Resolving Challenging Dye Combinations

The detection of some fluorochrome combinations by conventional flow cytometry presents a challenge due to high amounts of spectral overlap (Figure 1, 4). The Aurora addresses this challenge by using differences in full emission spectra signatures across all lasers to clearly resolve these combinations, even if the populations are co-expressed (Figures 2, 3, 5, and 6).

Example 1: APC and Alexa Fluor 647

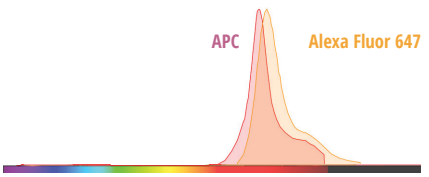


Figure 1: Spectrum plots from a conventional spectrum viewer shows heavy overlap between APC and Alexa Fluor 647.

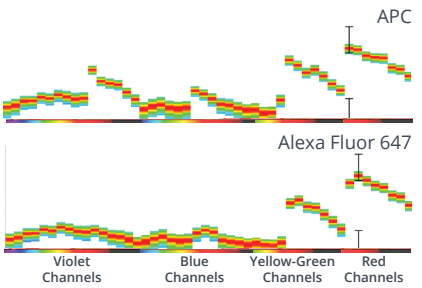


Figure 2: Spectrum plots from a four laser Aurora show distinct signatures for APC and Alexa Fluor 647.

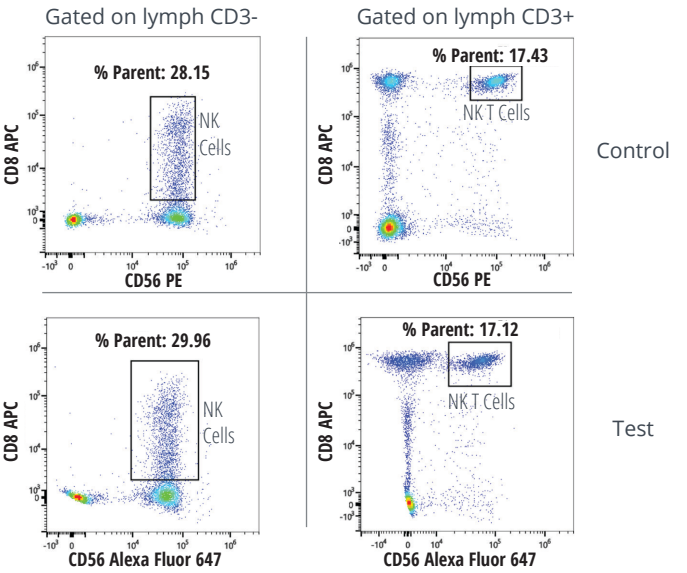


Figure 3: Whole blood from a healthy donor was stained, lysed, washed, and analyzed on a four laser Aurora system. Subsets of NK and NK T cells that co-express CD56 Alexa Fluor 647 and CD8 APC were easily identified. For comparison, blood from the same donor was stained with CD56 PE and CD8 APC and yielded similar percentages of NK and NK T cells, demonstrating that APC and Alexa Fluor 647 combined did not impact results.

Example 2: BFP, GFP, and mCherry

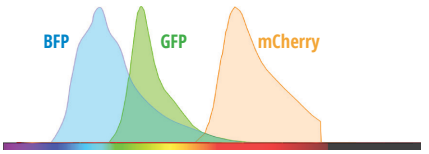


Figure 4: Spectrum plots from a conventional spectrum viewer.

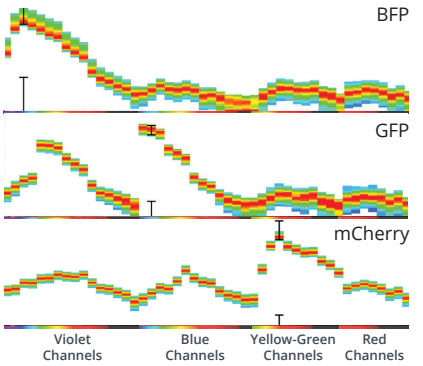


Figure 5: Spectrum plots from a four laser Aurora show distinct signatures for BFP, GFP and mCherry.

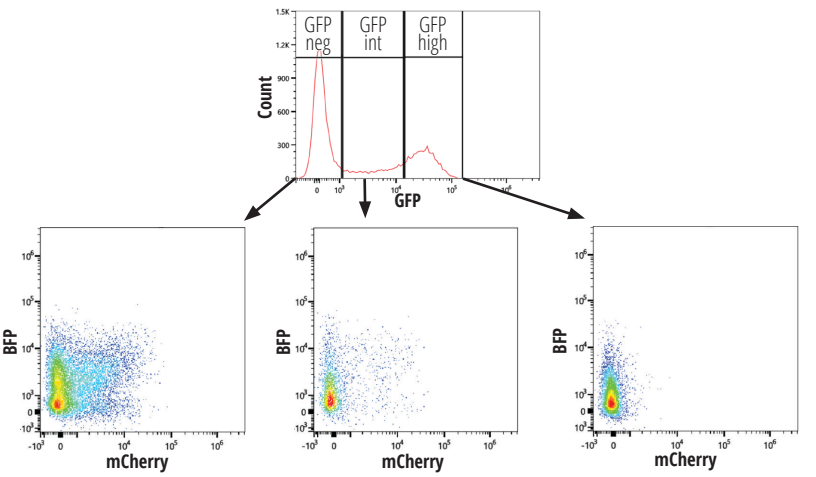


Figure 6: AB2.2 mouse embryonic stem cells were genetically modified to stably express BFP, GFP and mCherry under the control of different fate marker promoters. The stable cell line generated was then cultured under differentiation conditions, harvested, and analyzed on a four laser Aurora system to assess the expression of fluorescent proteins. Autofluorescence extraction was used to enhance results. Sample courtesy from Luigi Russo, Hannah L. Sladitschek and Pierre Neveu, Cell Biology & Biophysics, Neveu group, EMBL.

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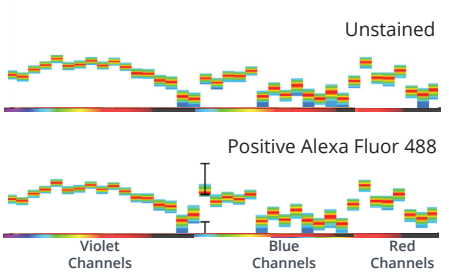
See More Clearly with Autofluorescence Extraction

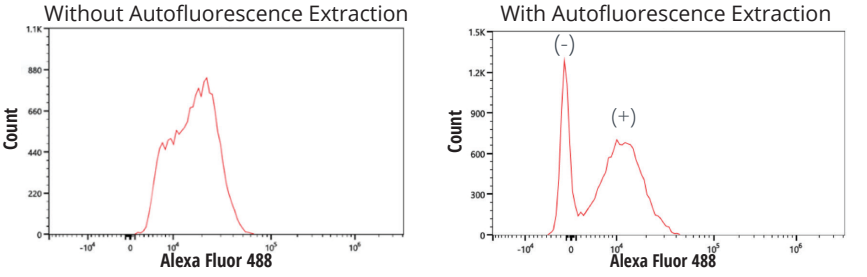
Aurora's implementation of full spectrum cytometry enables the use of autofluorescence extraction to further improve data clarity. Certain sample types, such as yeast and tumor samples, present the challenge of high autofluorescence. For these challenging applications involving highly autofluorescent particles, let the software's autofluorescence extraction tool bring new levels of resolution.

Example 1: PrimeFlow™ RNA Assay

Human U937 cells were subjected to the PrimeFlow™ RNA Assay. The cells underwent a series of hybridization steps to label mRNA for HMBS, a low expressed gene (~10 copies/cell), with Alexa Fluor® 488. The sample was run on the Aurora and analyzed using SpectroFlo® software with two different strategies, one with autofluorescence extraction and one without.



Spectrum plots of unstained and Alexa Fluor 488 stained cells acquired on the Aurora. Note that the two spectra heavily overlap.

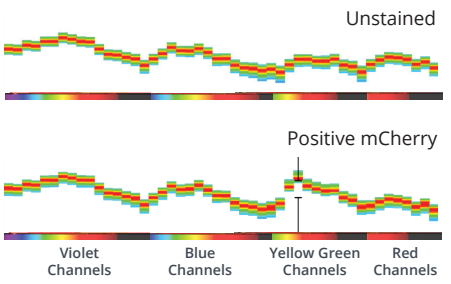


Due to high autofluorescence, separation of negative and positive signals was marginal (left histogram). Autofluorescence extraction greatly improved the resolution of the two cell populations (right histogram).

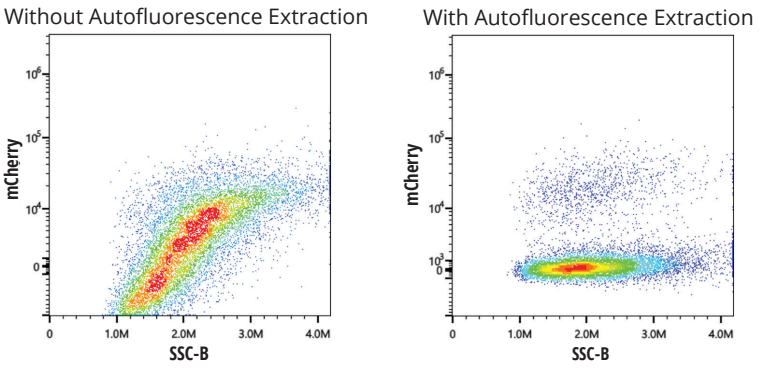
PrimeFlow™ is a trademark of Thermo Fisher Scientific

Example 2: mCherry Expressing HeLa Cells

HeLa human cells were transformed with a CRISPR-Cas9 target vector carrying an mCherry reporter. Expression of mCherry is driven by the endogenous promoter of the knocked-in gene. The cells were harvested 32 hour post-infection and analyzed on a four laser Aurora system to assess integration of the fluorescent protein. Autofluorescence extraction was used to enhance the resolution. Sample courtesy of Malte Paulsen, Flow Cytometry and Cell Sorting Facility, EMBL.



Spectrum plots of unstained and positive mCherry cells acquired on the Aurora. Note that the two spectra heavily overlap.



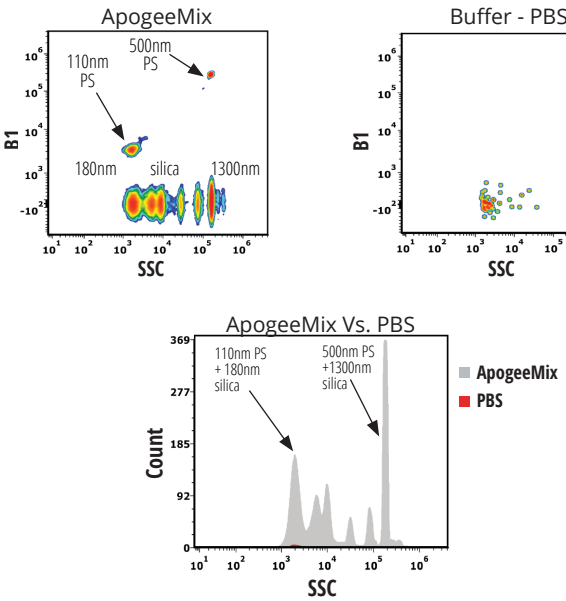
Due to high sample autofluorescence, negative and positive cell populations were nearly indistinguishable (left plot). Autofluorescence extraction greatly improved the resolution of the two cell populations (right plot).

Small Particles in Full View

With its onboard 100 mW 405 nm laser and highly sensitive violet SSC detector, particles nearing 100 nm in size can be analyzed. Aurora opens the door to a wide variety of small particle applications, taking what was once hidden and placing it in full view.

Example 1: ApogeeMix

Resolution of ApogeeMix from Apogee Flow Systems (www.apogeeflow.com), a mixture of silica and polystyrene (PS) beads ranging from 110 nm to 1300 nm, when acquired on the Aurora. The smallest particles can be easily identified above background.



Data analyzed using FCS Express 6 by De Novo™ Software.

Example 2: ViroFlow

Murine Leukemia Virus (MLV-124 nm ±14 nm) genetically engineered to express superfolder GFP (sfGFP) as a fusion protein with the viral envelope glycoprotein.

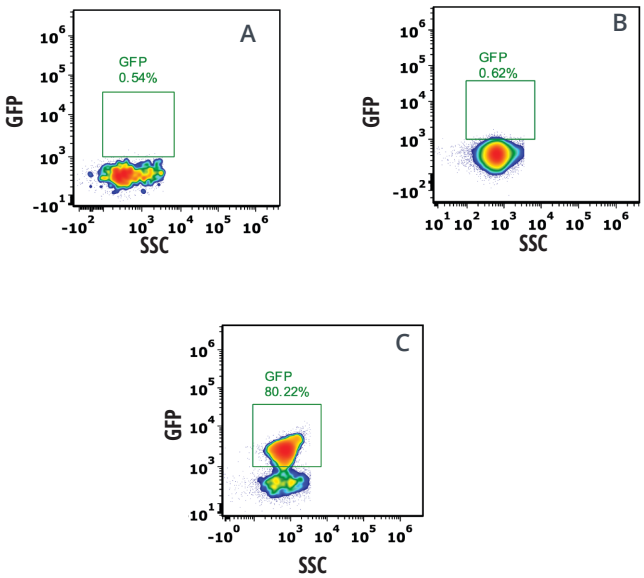
The plots on the right show:

A) Buffer only

B) MLV with no sfGFP (MV-M-Zero)

C) MLV with sfGFP-Env (MV-M-sfGFP)

All samples were run on a three laser Aurora using violet SSC as a threshold trigger. Virus reference particles were provided by ViroFlow Technologies (www.viroflowtechnologies.com).



Data analyzed using FCS Express 6 by De Novo™ Software.

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More Choice, Greater Flexibility, Easier Setup

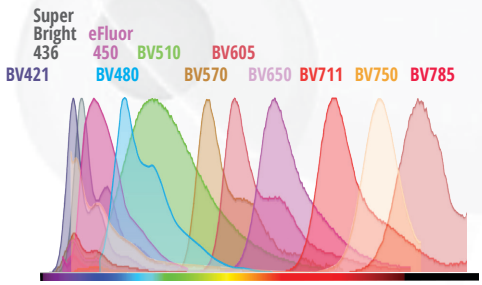
The optical design combined with the unmixing capability in SpectroFlo® software allows greater fluorochrome choice, panel flexibility, and easy setup without having to change filters. The three laser configuration provides outstanding multi-parametric data for a wide array of applications. Markers and fluorochromes in a 24-color panel designed for identification of circulating cell subsets in human peripheral blood are summarized in the table below:

SPECIFICITY	FLUOROCHROME	SPECIFICITY	FLUOROCHROME	SPECIFICITY	FLUOROCHROME
CCR7	Brilliant Violet 421™	CD11c	BD Horizon™ BB515	CD27	APC
CD19	Super Bright 436	CD45RA	Alexa Fluor® 488	CD123	Alexa Fluor® 647
CD16	eFluor® 450	CD3	Alexa Fluor® 532	CD127	BD Horizon™ APC R700
TCR γ/δ	BD Horizon™ BV480	CD25	PE	HLA DR	APC/Fire™ 750
CD14	Brilliant Violet 510™	IgD	PE/Dazzle™ 594		
CD8	Brilliant Violet 570™	CD95	PE-Cy™5		
CD1c	Brilliant Violet 605™	CD11b	PerCP-Cy™5.5		
PD-1	Brilliant Violet 650™	CD38	PerCP-eFluor® 710		
CD56	Brilliant Violet 711™	CD57	PE-Cy™7		
CD4	Brilliant Violet 750™				
CD28	Brilliant Violet 785™				

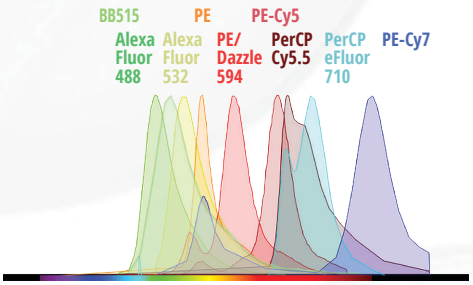
24-COLOR DATA

On the next page, this 24-color panel is demonstrated in a normal healthy human whole blood donor using a lyse wash prep.

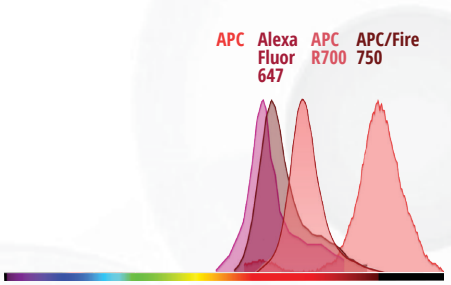
The 24-Color Panel Includes Many Highly Overlapping Dyes:



Violet Excited Dyes
Emission Spectra



Blue Excited Dyes
Emission Spectra



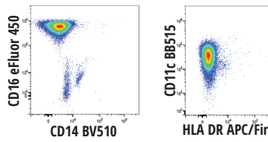
Red Excited Dyes
Emission Spectra

A New Reality:

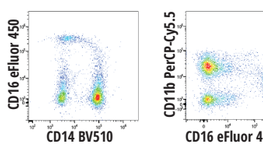
3 Lasers, 24 Colors, Unparalleled Resolution

Aurora Makes It Possible

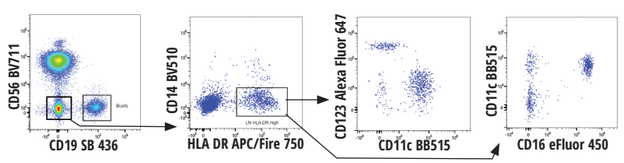
Granulocytes



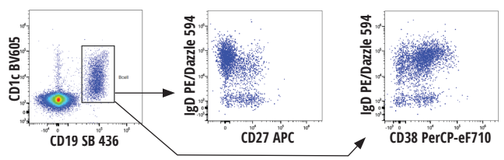
Monocytes



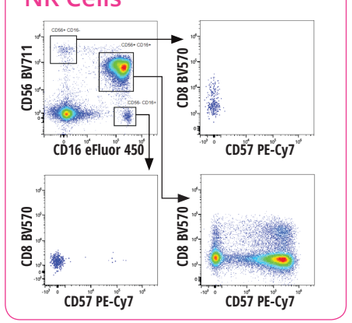
Lineage Negative Cells



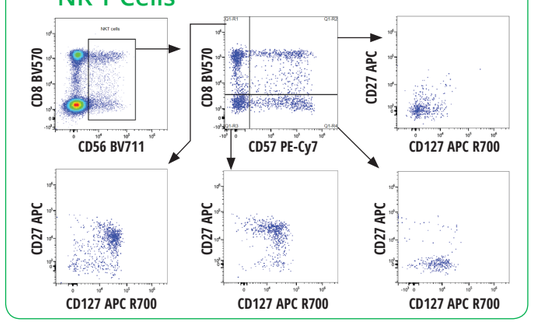
B Cells



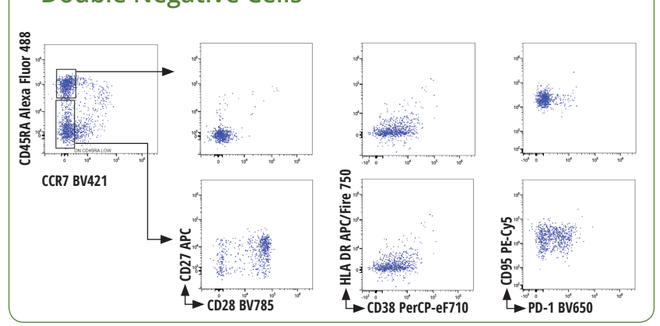
NK Cells

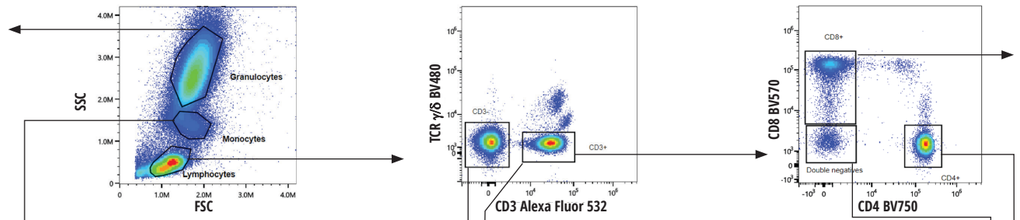


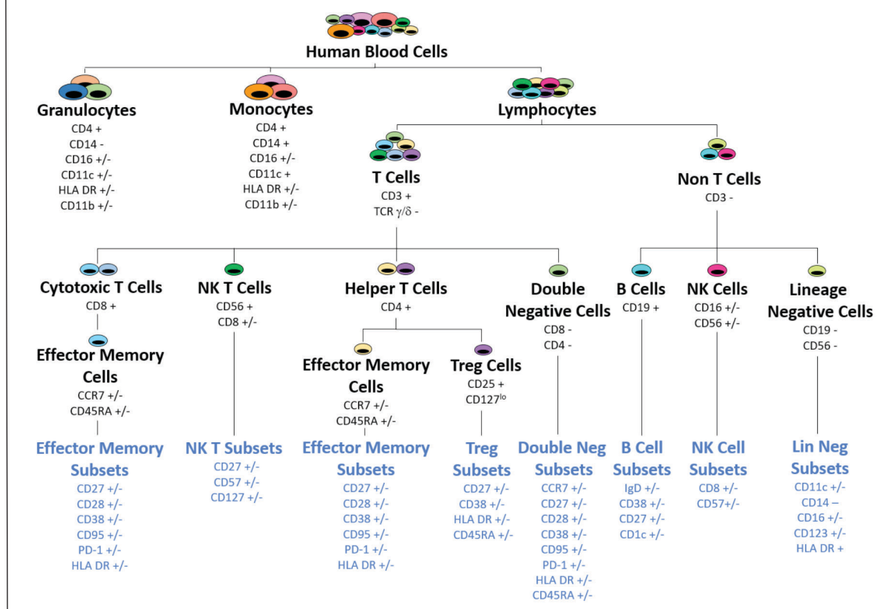
NK T Cells



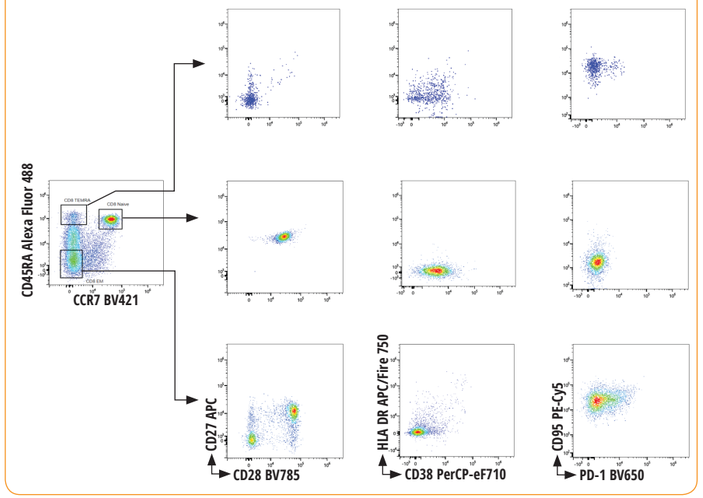
Double Negative Cells



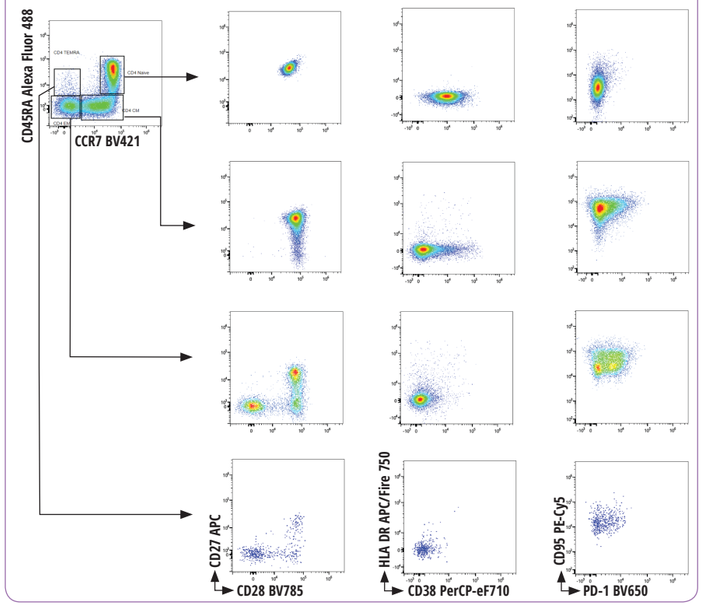




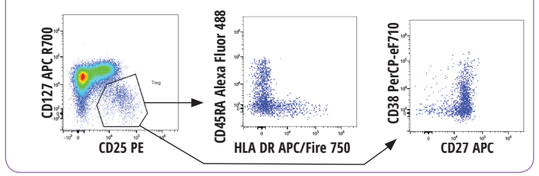
CD8+ Effector Memory Cells



CD4+ Effector Memory Cells



Treg Cells



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See More with the UV Laser

With the addition of the UV laser and a total of 64 fluorescence detectors, Aurora now has the power to take highly-multiplexed assays beyond 30 colors. Incorporation of the UV laser takes the Aurora platform to the next level.

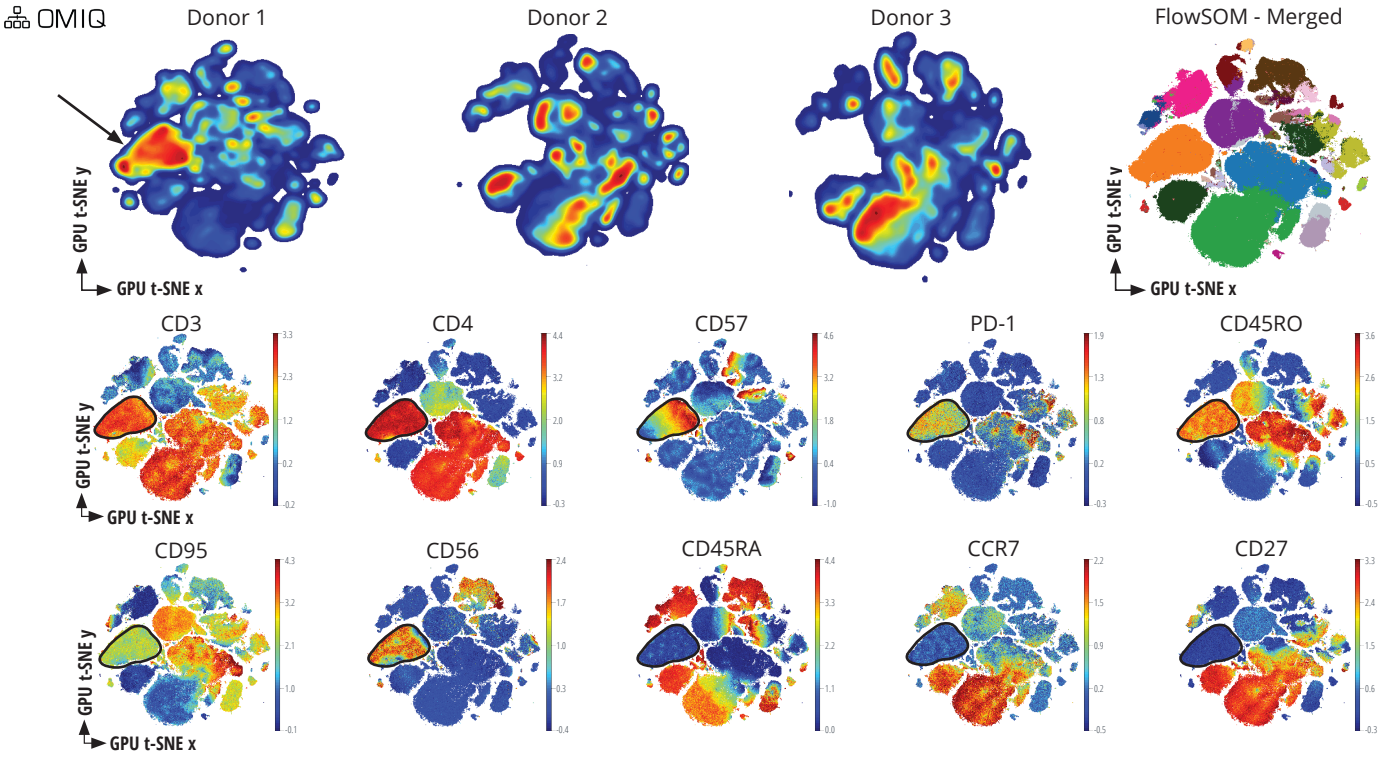
35-Color Panel

Markers and fluorochromes in a 35-color panel are summarized in the table below. Human peripheral blood mononuclear cells were stained, washed, and acquired on a five laser Aurora.

UV		Violet		Blue		Yellow Green		Red	
Specificity	Fluorochrome	Specificity	Fluorochrome	Specificity	Fluorochrome	Specificity	Fluorochrome	Specificity	Fluorochrome
CD45RA	BD Horizon™ BUV395	PD-1	BV421	CD86	BB515	CD335	PE	CD27	APC
CD16	BD Horizon™ BUV496	CD123	Super Bright 436	CD57	FITC	CD4	CF®568	CD33	Alexa Fluor 647
CD14	BD Horizon™ BUV563	CD161	eFluor 450	CD19	CF®514	CD24	PE/Dazzle 594	CD127	APC-R700
CD11c	BD Horizon™ BUV661	IgD	BV480	CD45	PerCP	CD95	PE-Cy5	CD38	APC-eFluor 780
CD56	BD Horizon™ BUV737	CD3	BV510	CD11b	PerCP-Cy5.5	CD25	PE-Cy7		
CD45RO	BD Horizon™ BUV805	CD20	Pacific Orange	TCR γδ	PerCP-eFluor 710				
Dead Cells	LIVE/DEAD™ Blue	HLA DR	BV570						
		CD28	BV605						
		CXCR3	BV650						
		CCR6	BV711						
		CXCR5	BV750						
		CCR7	BV785						
		CD8	Qdot 800						

LIVE/DEAD™ is a trademark Thermo Fisher Scientific.
CF® is a registered trademark of Biotium.

t-SNE and FlowSOM Analysis



t-SNE analysis of 35 colors immunophenotyping panel using OMIQ software (www.omiq.ai). FCS files including only CD45+, singlets, and live cells were analyzed in OMIQ software. Scaling was optimized and t-SNE analysis was done using GPU t-SNE algorithm for all donors (top row). One cell subset was present only in donor one (see arrow in top row). Colored-continuous scatterplots for donor one showing marker expression in this unique subset are shown in the second and third rows. Clustering analysis by FlowSOM visualized by GPU-tSNE, shows metacluster two expressing CD3+/CD4+/CD57±/PD-1±/CD45RO+/CD95±/CD56±/CD45RA-/CCR7-/CD27-
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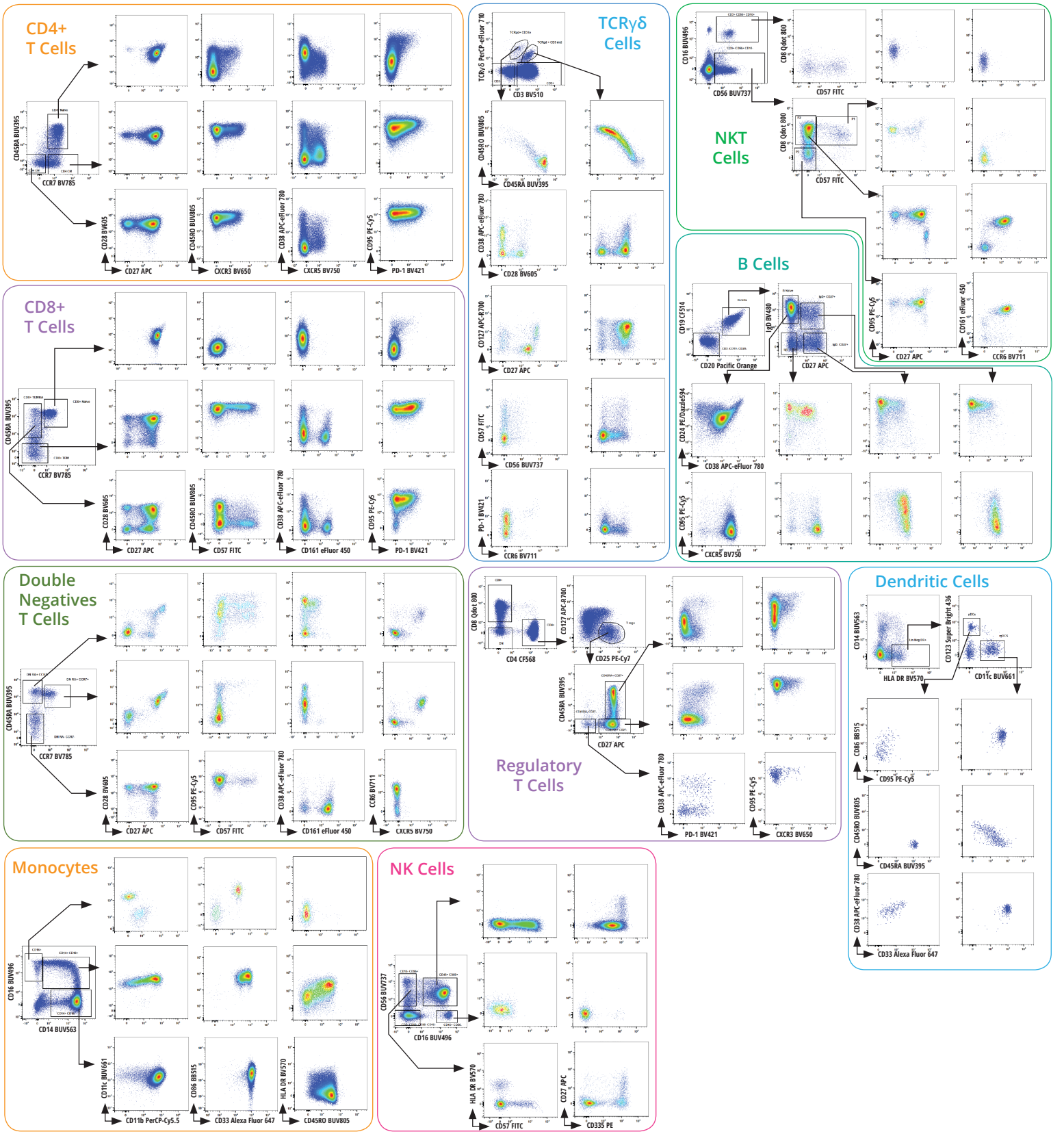
2D Dot Plots

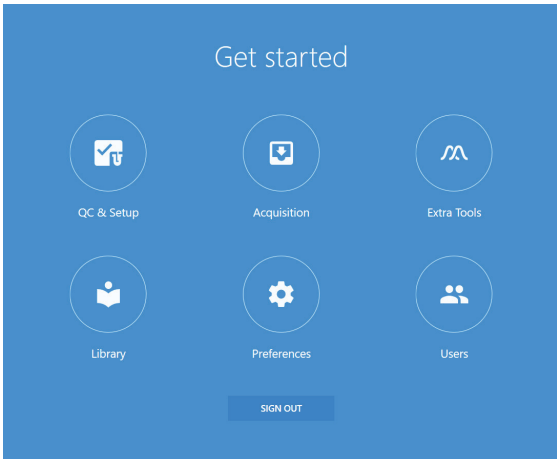

CD4+ T Cells
CD45RA BUV395
CCR7 BV785
CD28 BV605
CD27 APC
CD45RO BUV805
CXCR3 BV650
CD38 APC-eFluor 780
CXCR5 BV750
CD95 PE-Cy5
PD-1 BV421
TCRγδ Cells
TCRγδ PerCP-eFluor 710
CD3 BV510
CD127 APC-R700
CD57 FITC
CD56 BUV737
CCR6 BV711
NKT Cells
CD16 BUV496
CD8 Qdot 800
B Cells
CD19 CF514
IgD BV480
CD20 Pacific Orange
CD24 PE/Dazzle594
CD161 eFluor 450
CD8+ T Cells
Double Negatives T Cells
Regulatory T Cells
CD4 CF568
CD25 PE-Cy7
Dendritic Cells
CD14 BUV563
CD123 Super Bright 436
HLA DR BV570
CD11c BUV661
CD86 BB515
Monocytes
CD11b PerCP-Cy5.5
CD33 Alexa Fluor 647
NK Cells
CD335 PE

SpectroFlo® Software Guided Workflows

The new SpectroFlo software offers an intuitive workflow from QC to data analysis with technology-enabling tools that simplify running any application.

QC and Setup:
Run Daily QC to monitor instrument performance and add reference controls.

Library:
Add or remove experiment templates, worksheet templates, fluorochrome information, QC bead information, and more.

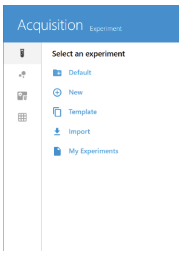


Extra Tools:
Unmix data using controls from different experiments or apply virtual filters to your data.

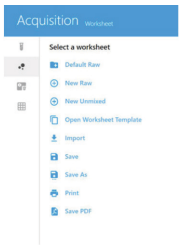
Users:
For administrative controls.

Preferences:
Customize the software appearance. Set default plot sizes, text sizes and fonts, gate colors, print layout, statistics table options, and more.

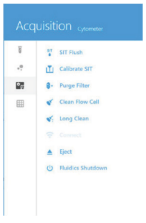
Acquisition:



Experiment Menu



Worksheet Menu



Fluidics Menu

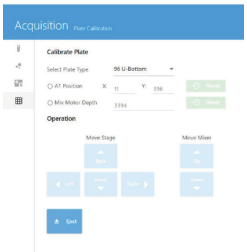
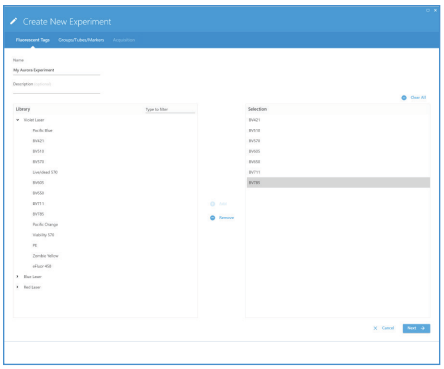


Plate Calibration

Experiment Workflow:

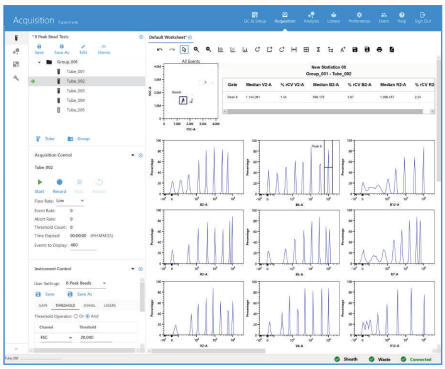
From the Acquisition menu, you can start a new experiment and get to your data in three simple guided steps.

Step 1: Create Your Experiment



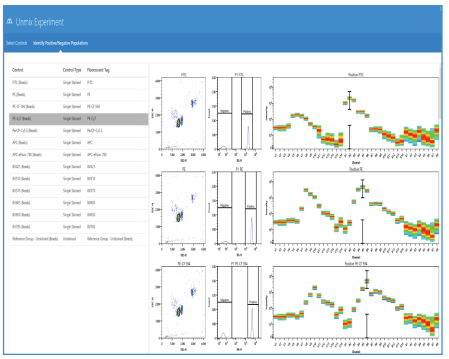
Create your experiment, choose fluorochromes, and add labels, tubes, worksheets, and stopping criteria in this guided workflow.

Step 2: Acquire Your Tubes



Load and acquire your samples.

Step 3: Unmix Your Data



Visualize your reference controls spectra using our unique unmixing wizard.

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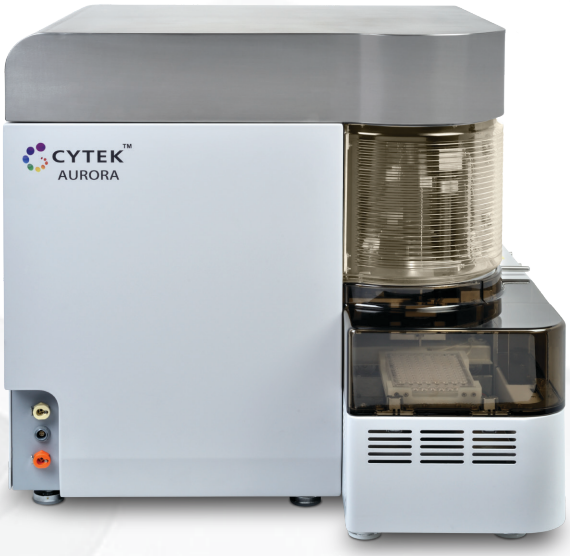
Get to Know Our Automatic Micro-Sampling System (AMS)



Meet the AMS

The AMS offers preset and user adjustable settings that allows the loader to be fine tuned to your experimental requirements. The AMS is specifically designed to streamline experimental workflow and seamlessly integrates into the Aurora. The AMS also offers ease of use and low carry over.

Reliable and easy

Reliable 96 well plate acquisition maximizes productivity.

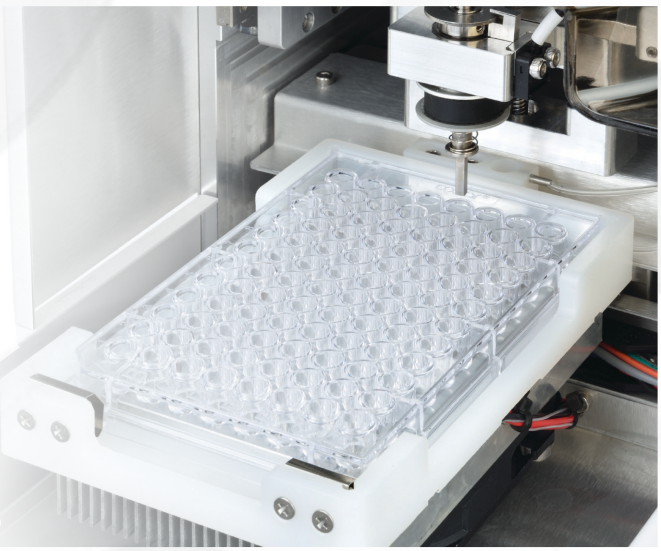
Easily change between plates and tubes in a matter of seconds.

Three throughput modes

Optimized acquisition speeds, from low carry over to high throughput.

User customizable modes

Fully customizable with a suite of user modes to fit a variety of applications and workflows.



We Are Here to Support You

Cytek Biosciences is dedicated to enhancing our customers' user experience. The Aurora system is backed by our world-class service and support team that can provide phone or field based assistance. Various levels of maintenance options are available to meet your needs now, and in the future.

Technical Support

We have a worldwide team of field service engineers and technical application specialists at your service. To maintain your instrument and keep it running well, you can choose the right service contract for your needs. Our technical applications specialists are here to support you with application related questions such as troubleshooting experiments, understanding or troubleshooting software behaviors, and more.

For help choosing the right service contract, contact your sales representative at sales@cytekbio.com.

For service and application support, contact us at support@cytekbio.com.

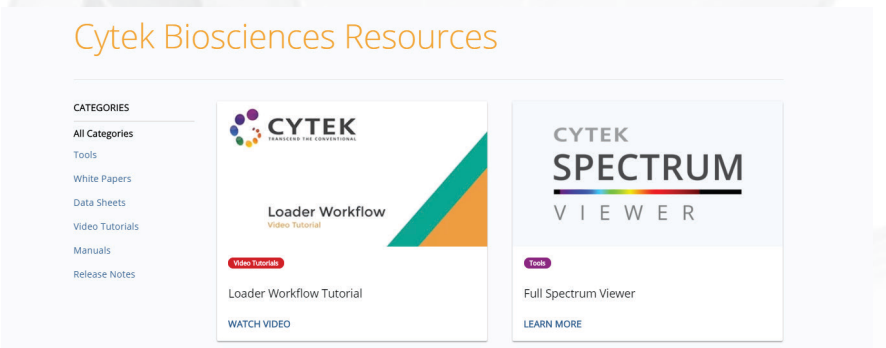
Training

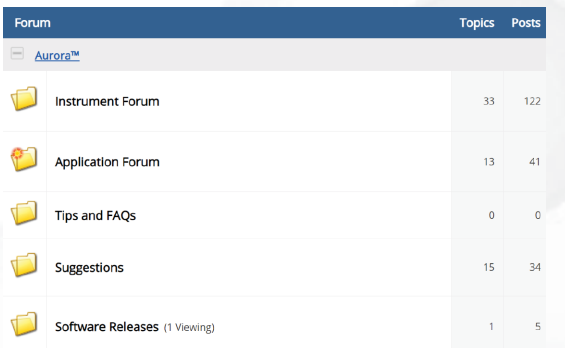
We offer two days of in-depth, interactive, hands-on training with each new instrument installation. If you later have a need for additional training, we offer a shorter one day refresher option. To learn more, speak to your Cytek sales representative or email us at sales@cytekbio.com.

Online Resources

As Cytek grows so will the tools on our website to enhance your experience with your full spectrum cytometer. For example, you can interact with other Aurora and Northern Lights users and our technical applications support staff in the Aurora User Community (contact your sales representative to learn how to activate your account). Need to learn more about dyes used on the Aurora? Click on the reagents tab to find panel design examples and other optimization tools.

Visit www.cytekbio.com regularly as we introduce more exciting tools throughout the year.





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Specifications

Optics

EXCITATION OPTICS

OPTICAL PLATFORM
Aurora contains a fixed optical assembly with the capacity to be configured with up to five spatially separated laser beams. Laser delays are automatically adjusted during instrument QC.

LASERS
Base model three-laser configuration: 405 nm: 100 mW, 488 nm: 50 mW, 640 nm: 80 mW
Available laser upgrades: 355 nm: 20 mW, 561 nm: 50 mW

BEAM GEOMETRY
Flat-Top laser beam profile with narrow vertical beam height optimized for small particle detection.

EMISSION OPTICS

EMISSION COLLECTION
Fused silica cuvette coupled to high NA lens for optimum collection efficiency to optical fibers.

FORWARD AND SIDE SCATTER DETECTION
FSC: high-performance semiconductor detector with 488nm bandpass filter
SSC: two high-performance semiconductor detectors with 405nm and 488nm bandpass filters

FLUORESCENCE DETECTORS
Proprietary high sensitivity Coarse Wavelength Division Multiplexing (CWDM) semiconductor array per laser enabling more efficient spectrum capture in the 365-829 nm range. No filter changes required for any fluorochrome excited by the 355 nm, 405 nm, 488 nm, 561 nm, 640 nm lasers.

STANDARD OPTICAL CONFIGURATION

Violet detector module: 16 channels unevenly spaced bandwidth from 420-829 nm.
Blue detector module: 14 channels unevenly spaced bandwidth from 498-829 nm.
Red detector module: 8 channels unevenly spaced bandwidth from 652-829 nm.

4 and 5 Laser Options:
Yellow-Green detector module: 10 channels unevenly spaced bandwidth from 567-829 nm.
Ultraviolet detector module: 16 channels unevenly spaced bandwidth from 365-829 nm.

Fluidics

SAMPLE FLOW RATES
Low: 15 µL/min, Medium: 30 µL/min, High: 60 µL/min, Plate high-throughput mode: 100 µL/min

FLUIDIC MODES
Long clean, SIT flush, Purge filter, Clean flow cell

MANUAL SAMPLE INPUT FORMATS
12x75 mm polystyrene and polypropylene tubes

STANDARD FLUIDIC RESERVOIRS
4L fluid container set with level-sensing provided. Compatible with 20 L sheath and waste cubitainers.

VOLUMETRIC SENSOR
Volumetric measurement during sample recording enables calculation of counts per µL for any gated population.

PLATE LOADER OPTION

96-well microtiter plate capability

Throughput time 35 minutes at High Throughput mode sampling 7 µL/well

Plate stage temperature: 4-30°C

PLATE LOADER CARRYOVER
Default mode: ≤0.3%, Low Carryover mode: ≤0.1%, High Throughput mode: ≤1%

Performance

FLUORESCENCE SENSITIVITY
FITC: ≤35 MEFL, PE: ≤10 MEFL, APC: ≤10 MEFL, Pacific Blue: ≤25MEFL

*Measurements based on an average from two systems, one three lasers and one five lasers, and performed using SPHERO Rainbow Calibration Particle (RCP-30-5A) based on its peak emission channel.

FLUORESCENCE LINEARITY
FITC R^2 ≥0.995 / PE R^2 ≥0.995

FORWARD AND SIDE SCATTER RESOLUTION
Performance is optimized for resolving lymphocytes, monocytes, and granulocytes.

SIDE SCATTER RESOLUTION
Capable of resolving 0.2 µm beads from noise.

CARRYOVER
≤0.1%

DATA ACQUISITION RATE
35,000 events/s*
*Three laser system

Software

SPECTROFLO® SOFTWARE

Live unmixing during acquisition

Developed specifically to streamline assay setup, data acquisition, and file export

Automated QC module

Autofluorescence extraction

Raw and Unmixed FCS 3.1 files

Electronics

SIGNAL PROCESSING
Digital signal processing with automatic window gate adjustment.

22-bit 6.5 log decades.

Threshold using any single parameter or combination of parameters.

PULSE SHAPE PARAMETERS
Pulse Area and Height for every parameter. Width for scatter parameters and one fluorescence parameter for each laser.

Workstation

Workstation specifications may vary between laser configuration; below is for three-laser configuration.

OPERATING SYSTEM
Windows® 10 Pro 64-bit

PROCESSOR
Intel® Core™ i7 processor, 3.6 GHz

RAM
16 GB

HARD DRIVE
500GB SSD / 1 TB SATA

VIDEO PROCESSOR
NVIDIA® GeForce

MONITOR
32" UHD 4K Monitor

Installation Requirements

Dimensions (W x D X H)

INSTRUMENT DIMENSIONS
Without loader: 54 x 52 x 52 cm
With loader: 58.4 x 62 x 52 cm

INSTRUMENT WEIGHT
Instrument weight (5 lasers): 71 kg
Loader weight: 13 kg

COMPUTER DIMENSIONS
29.1 x 9.25 x 34.4 cm

RECOMMENDED WORKSPACE
157 x 71 x 132 cm

Room Requirements

POWER
100-240 V, 50/60 Hz, 2A max

HEAT DISSIPATION
500 W with all solid-state lasers

TEMPERATURE
15–28°C

HUMIDITY
20%-85% relative non-condensing

AIR FILTERING
No excessive dust or smoke

LIGHTING
No special requirements

Regulatory Status

For Research Use Only. Not for use in diagnostic or therapeutic procedures.

For more information, email us at:
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