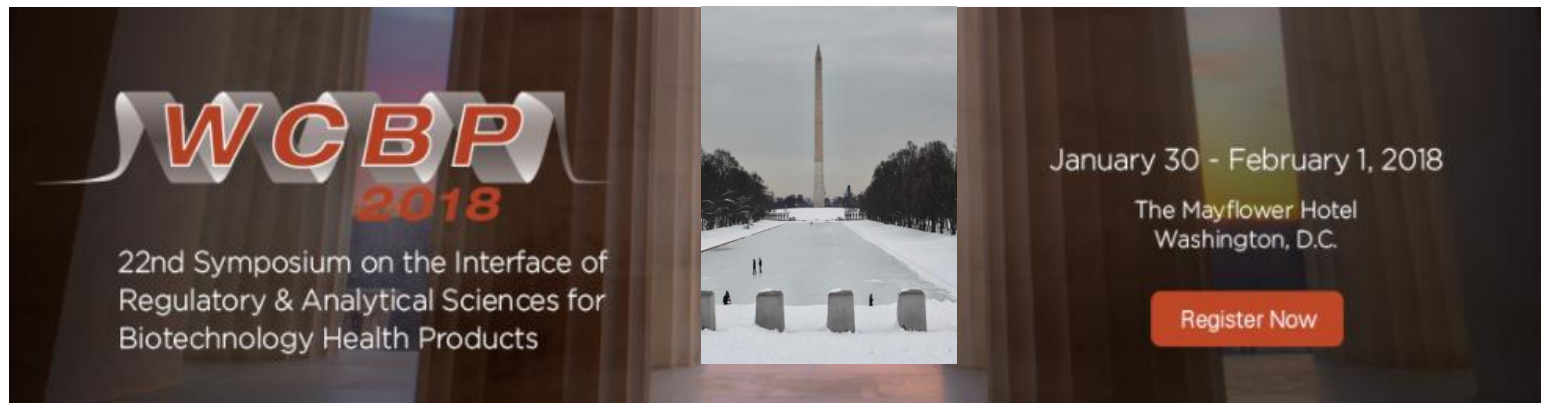
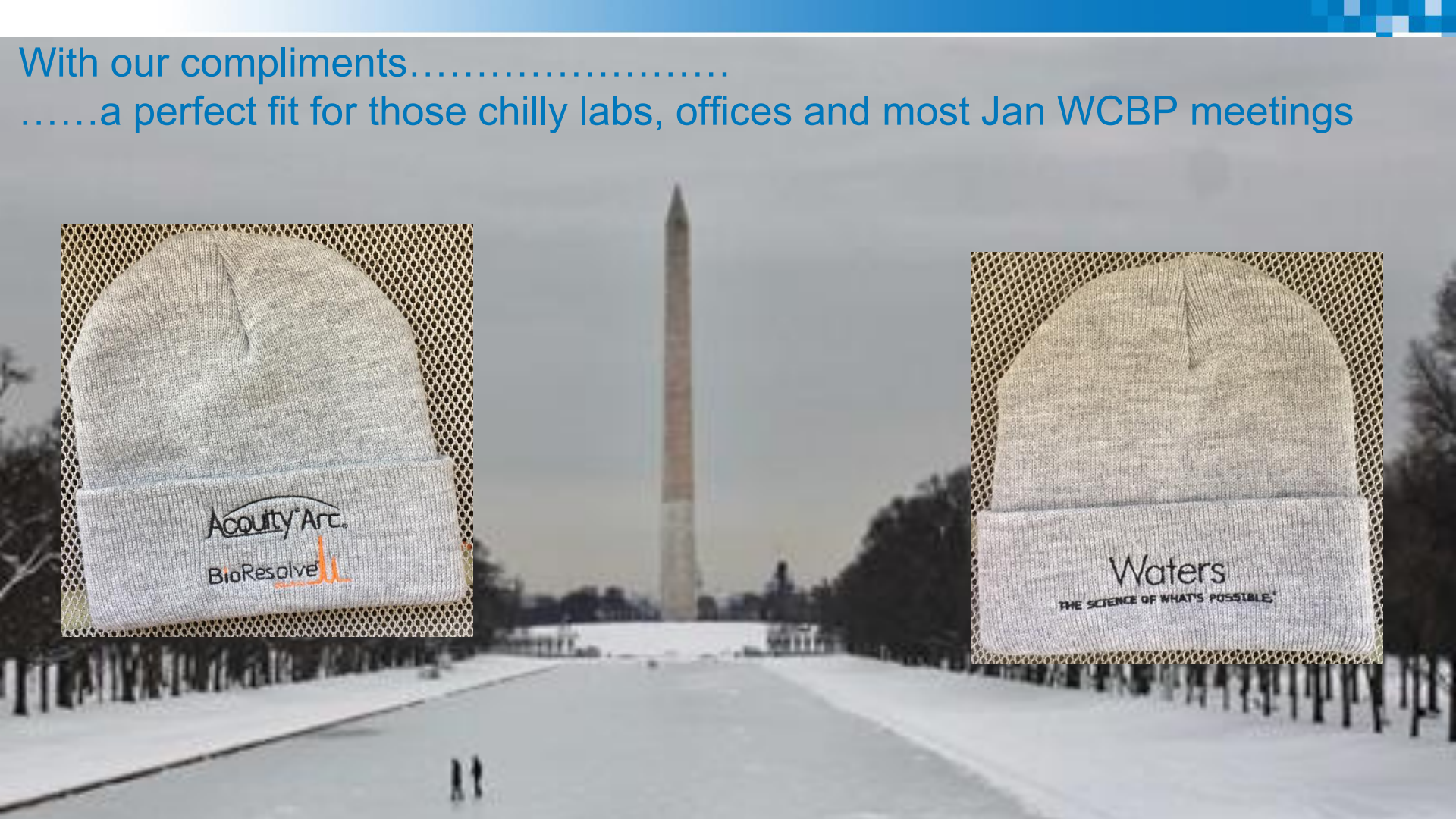


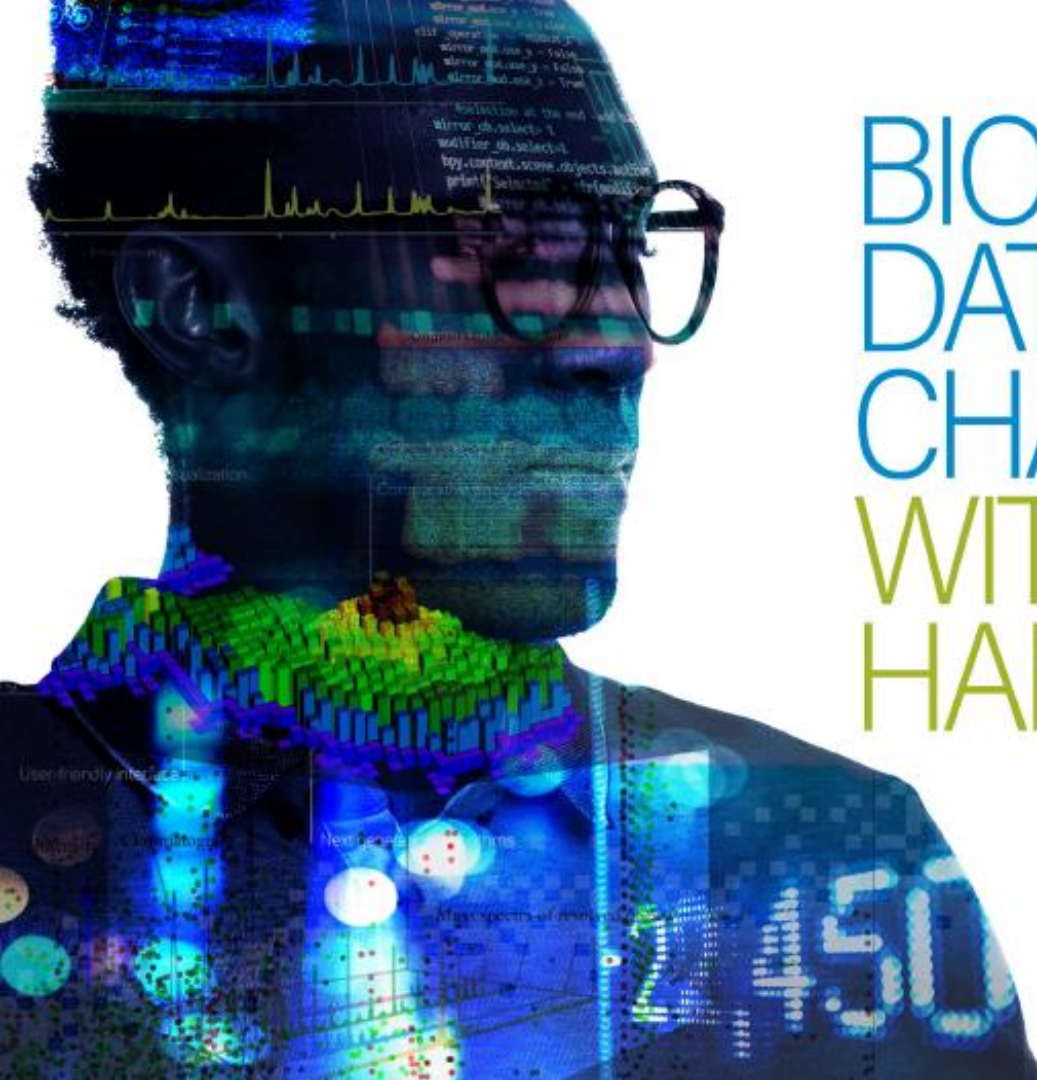
*Data is the common currency: What does it take to harmonize technologies and workflows across biopharmaceutical organizations?*

## WCBP 2018 Wed Lunch Session

A promotional banner for the WCBP 2018 symposium. The banner is divided into three sections. The left section features the 'WCBP 2018' logo in a stylized, 3D font with 'WCBP' in white and '2018' in red. Below the logo, the text reads '22nd Symposium on the Interface of Regulatory & Analytical Sciences for Biotechnology Health Products'. The middle section is a photograph of the Washington Monument in winter, with snow on the ground and trees. The right section contains the dates 'January 30 - February 1, 2018', the location 'The Mayflower Hotel Washington, D.C.', and a red button with the text 'Register Now'.

With our compliments.....  
.....a perfect fit for those chilly labs, offices and most Jan WCBP meetings





BIOPHARMA  
DATA IS JUST  
CHAOS  
WITHOUT  
HARMONIZATION.

Waters  
THE SCIENCE OF WHAT'S POSSIBLE.

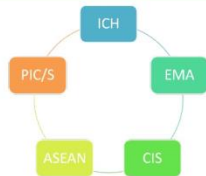


Informatics Challenges  
in Pharma and  
Biopharma R&D



Harmonization and Simplification

Harmonization of regulatory requirements



Wednesday, August 23, 2017

Emerging Trends Of Regulatory Compliance

Confidential

Do You Hold Your  
Scientific Data  
Together with  
Duct Tape?

Harmonization and  
Simplification in  
Lab Informatics



# Waters

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ICH

- INTERNATIONAL CONFERENCE ON HARMONISATION (ICH) OF TECHNICAL REQUIREMENTS FOR REGISTRATION OF PHARMACEUTICALS FOR HUMAN USE.

DATA HARMONIZATION  
AND EXCHANGE

## Harmonization:

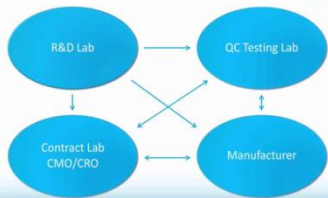
As a corporate strategy, harmonization is the effort to minimize organizational chaos, and institute an integrated strategy for deploying and maintaining analytical and informatics resources.

Urgency for Harmonization  
& One Quality Voice

John S. Hensch, Ph.D.  
Height, Advice & Solutions, LLC  
The National Institute for Pharmaceutical Technology & Education, Inc.

abc

Method Transfer



International Conference on  
Harmonization



"Strategic Planning for Global  
Harmonization at R&D and QC  
Laboratories"

DOWNLOAD LITERATURE

ASEAN Pharmaceutical  
Harmonization

Selvaraja Seerangam  
National Pharmaceutical Control Bureau  
Ministry of Health Malaysia

V Conference of PANDRH 2008  
17-19 November 2008, Argentina



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30 CRITICAL  
QUALITY ATTRIBUTES

SPANNING DATA SOURCES,  
PLATFORMS, AND LOCATIONS.

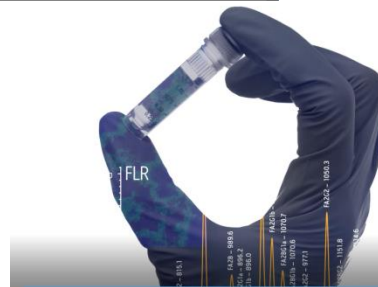
AND JUST ONE  
UNINTERPRETABLE  
DATA ARTIFACT  
COULD SEND YOUR  
ENTIRE PROJECT  
INTO CHAOS.



WHAT IF YOUR  
DATA COULD BE  
HARMONIZED?



FROM  
DEVELOPMENT TO  
MANUFACTURING  
AND QC



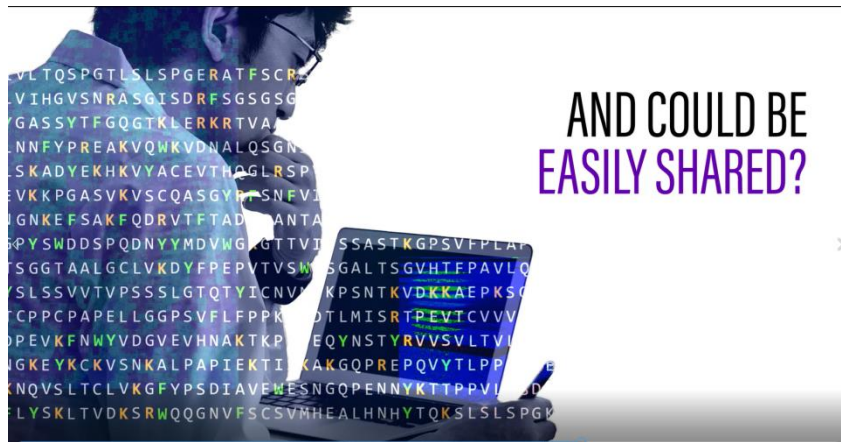
FROM  
CENTRAL LABS TO  
DISTRIBUTED LABS



Waters  
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WHAT IF ALL YOUR DATA  
WERE COMPLIANT-READY  
UPON CAPTURE? >



AND COULD BE  
EASILY SHARED? >



# Waters

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BECAUSE BIOLOGY  
IS VARIABLE

Intensity

Mass [Da]

Biosimilar

204.08 292.09 513.25 819.29 898.35 1080.42 1122.41 1222.46 1425.52 1587.57 1716.60 1878.64 1952.72 2225.74

Waters Biopharma - Outbound Video - Final Cut - 18012b



BUT YOUR RESULTS  
SHOULDN'T BE.

Waters Biopharma - Outbound Video - Final Cut - 18012b



# Innovation at the Center of Corporate Strategy

Growth through **focus, innovation, and quality** of the total customer experience

## Innovation Leadership

- Advance **best-of-breed technologies** for the most demanding analytical measurement needs
- Redefine innovation as **simpler, smarter, more robust and deployable** solutions that will change the basis of competition
- **Breakthrough innovation** harnessing the potential of technology to one day change the world

R&D growing to  
**8.5%** of  
sales, from 7.5%  
just **5** years ago

Customers, technology and competitors are changing

Elevate the dialogue on innovation

Simpler, more robust systems

Deliver Benefit Through Innovation

Transformational engineering

Integrated systems

## THE SHORTEST DISTANCE BETWEEN TWO LABS IS AN ARC

It shouldn't matter if your analysis is performed in the lab down the hall or the lab around the world.

See what's possible with method transfer at: [Waters.com/methodtransfer](https://www.waters.com/methodtransfer)

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**Waters**  
THE SCIENCE OF WHAT'S POSSIBLE.®

## THE SHORTEST DISTANCE BETWEEN TWO MINDS IS AN **ARC**

A method shouldn't keep you tethered to a single technology, brand, or lab.

See what's possible with technology transfer at: [Waters.com/methodtransfer](https://www.waters.com/methodtransfer)

## ACQUITY Arc **Bio** System

A Solution For your Daily Bioseparations Challenges





# Which systems are the best for your challenges?

**Waters**  
THE SCIENCE OF WHAT'S POSSIBLE.®



## Alliance HPLC

## ACQUITY Arc / Arc Bio (UHPLC)

## ACQUITY UPLC H-Class H-Class Bio/ I-Class

Chemistry Compatibility

≥ 4.6 mm ID Columns  
≥ 3.5 μm Porous Particles

≥ 3.0 mm ID Columns  
≥ 2.5 μm Porous Particles

≥ 2.1 mm ID Columns  
≥ 1.7 μm Porous Particles

Detection

Optical (UV, PDA, FLR) and ACQUITY QDa Mass Detection

MS Compatibility

SQD2

SQD2, QQQ, TOF, QTof

Software Compatibility

Empower, MassLynx

Empower, MassLynx, UNIFI

Common Role(s)

Routine analysis (QA/QC)  
Monitoring (Late Development)

Monitoring (Late Development)  
Routine analysis (QA/QC)  
Method Development & Transfer  
Characterization (Development)

Characterization (Development)  
Monitoring (Late Development)  
Routine analysis (QA/QC)

# ACQUITY Arc Bio: A Biocompatible UHPLC

Waters

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## Bio-inert Flow Paths

Minimize undesirable protein interactions and maximize system robustness under salt and pH extremes to maximize system uptime

## AutoBlend Plus Technology

Program gradients directly in terms of pH and ionic strength to minimize manual mobile phase preparation, reduce human error and accelerate method robustness testing for Reversed-Phase or Ion-Exchange chromatographic methods.

## ACQUITY QDa Mass Detector

Increase the analytical value of every analysis by adding mass information for improved sample characterization

## Arc™ Multi-Flow Path Technology

Delivers HPLC and UHPLC method compatibility through selectable dwell volume, simplifying method transfer



## bioQuaternary Solvent Management

Precise and accurate blending of up to four solvents accommodating the range of aqueous, high ionic strength mobile phases and organic solvents used in Bioseparations.

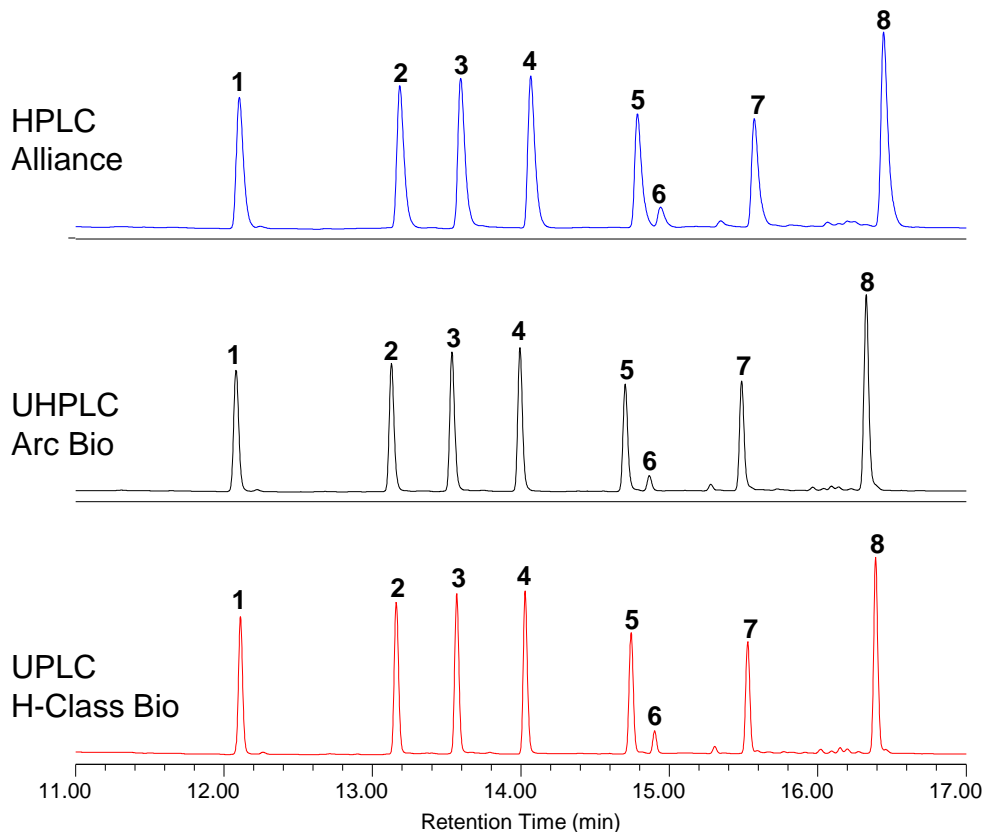
## Address your Workflow

With a comprehensive portfolio of column chemistries and standards specifically developed and QC tested for Bioseparations.

Supported by industry-leading informatics software, including Empower and MassLynx.

# Peptide Standards: Common 10 min gradient method

XBridge® BEH™ Peptide C18 130 Å, 2.5 μm, 4.6 x 100 mm



$$P_{c,4\sigma} = 1 + \left[ \left( \frac{2.35}{4} \right) \left( \frac{t_{gradient}}{w_{h,avg}} \right) \right]$$

	Alliance	Arc	H-Class
Resolution P5-P6	1.7	2.7	3.1
Pc,4σ (Ave P1-P8)	118	170	196

**Poster P116T** Assessing Performance and Method Transfer of Monoclonal Antibody and Peptide Bioseparation Methods Using a Novel Biocompatible UHPLC System

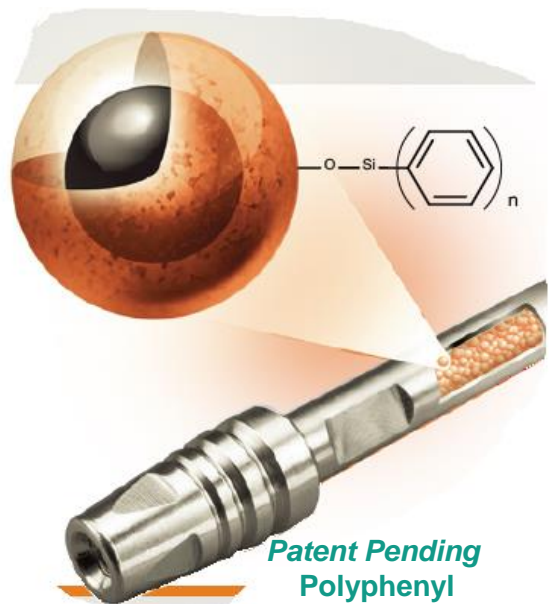
## A Next Generation Reversed-Phase Column for Monoclonal Antibody, Antibody Subunit and ADC Separations

BioResolve™  
COLUMNS 

More Than  
Just a  
Column.™

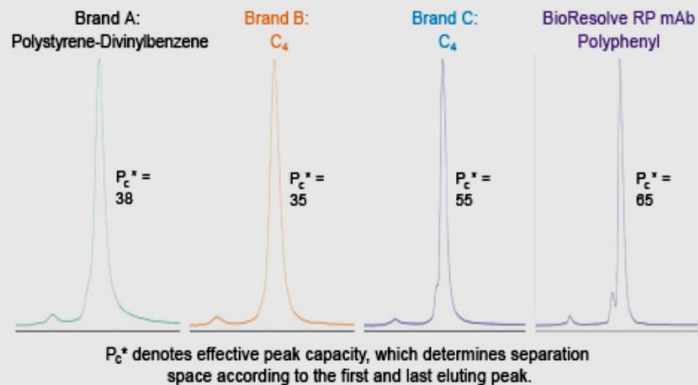


# BioResolve RP mAb, Polyphenyl: Novel Phenyl Bonding on a new 450 Å, Solid Core Particle Technology

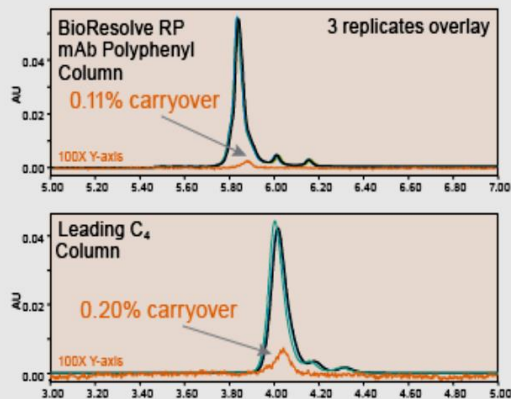


- Silica-based, solid core particles with defined **450Å pore** coating delivers outstanding resolution, recovery, and low injection to injection carryover.
- Use of innovative **polyphenyl ligand** composition and bonding technology (patent pending) delivers superior intact mAb and subunits separations in LC (0.1% TFA) or LC/MS (0.02% TFA or 0.1% FA) applications.
- The above two attributes synergistically translate into...
  - Low pH stability leading to improved column lifetime
  - Better recoveries at lower temperatures
- **2.7 µm particles** deliver near equivalent performance on HPLC, UHPLC, and UPLC instrumentation.

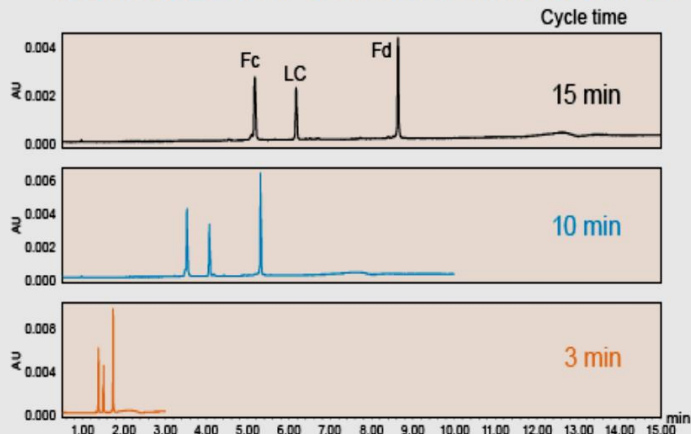
## INCREASED COMPONENT RESOLUTION



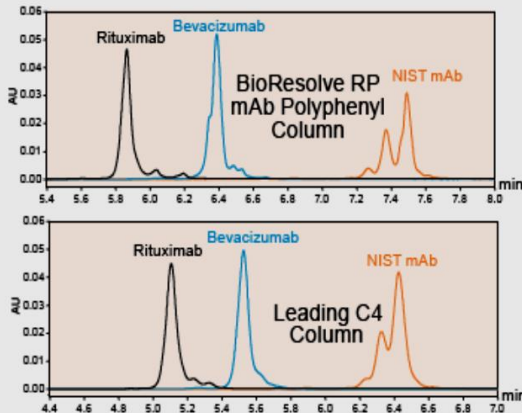
## MINIMAL CARRYOVER



## TECHNOLOGY FOR HIGH THROUGHPUT



## IMPROVED SELECTIVITY



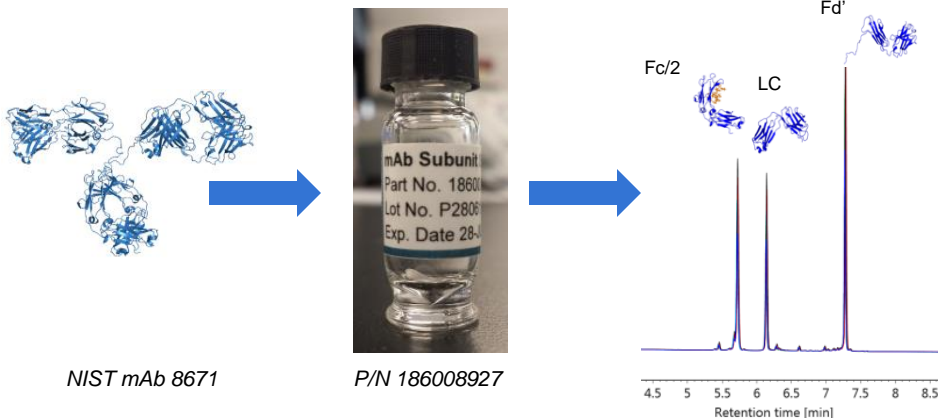
Waters  
THE SCIENCE OF WHAT'S POSSIBLE.®

- ✓ High Resolution
- ✓ Low Carryover
- ✓ Scalable Throughput
- ✓ Unique Selectivity



# NEW !!! - mAb Subunit Standard (P/N 186008927)

- 25 µg of Reduced, IdeS-digested NIST Reference Material 8671
- Desalted, stabilized with excipients, and lyophilized
- Excellent stability
- For proficiency testing and benchmarking of protein RPLC
- Used internally to QC Prototype batches and columns

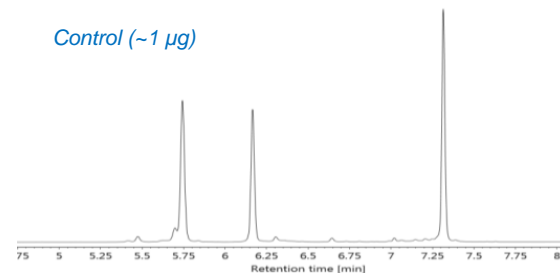


NIST mAb 8671

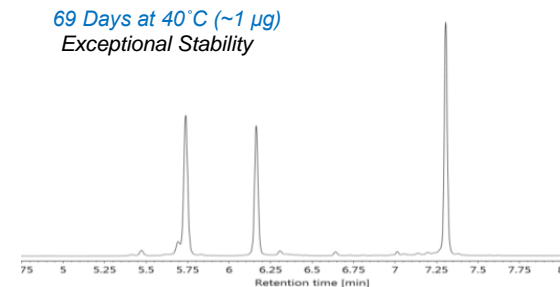
P/N 186008927

Retention time [min]

Good Reproducibility



Control (~1 µg)



69 Days at 40°C (~1 µg)  
Exceptional Stability

# Characterization of mAb IdeS Subunits

## Reversed Phase Workflow

**Sample Preparation**  
mAb Subunit Std

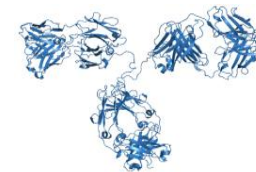
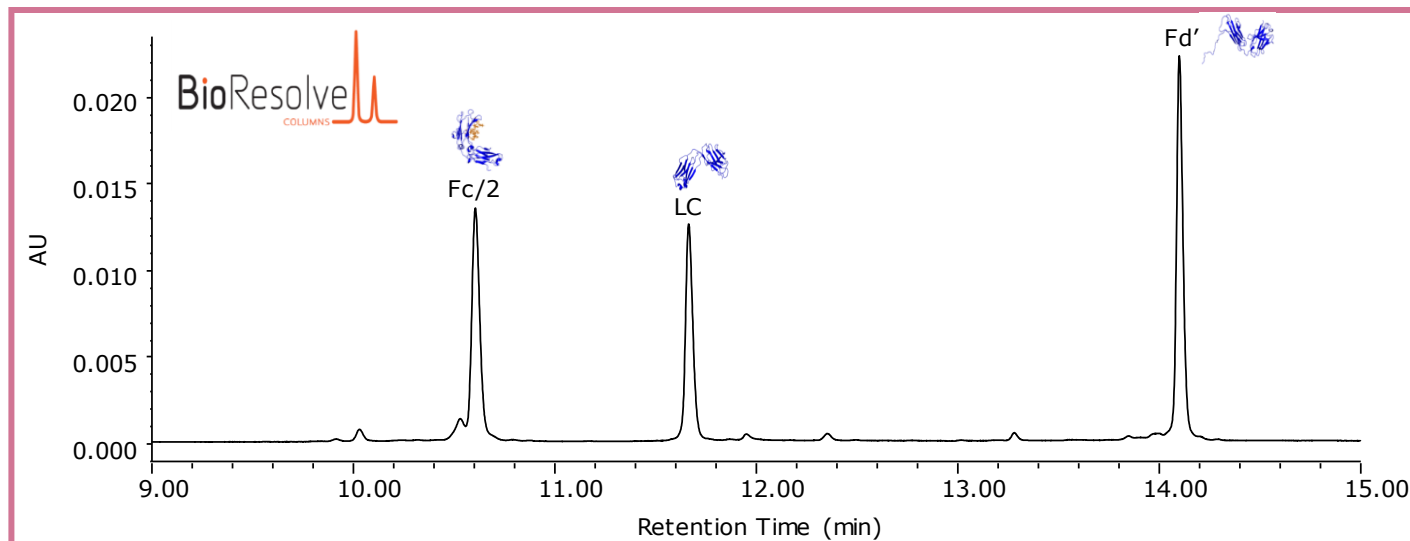
**LC Separation**  
ACQUITY Arc Bio

**Column Chemistry**  
BioResolve® RP-mAb  
2.7 µm, 4.6 x 50mm

**Detection**  
ACQUITY Arc  
2489 UV/Vis

**Analyze**  
Empower 3 Software  
**Pre-configured Methods**

**Services**  
Method Development

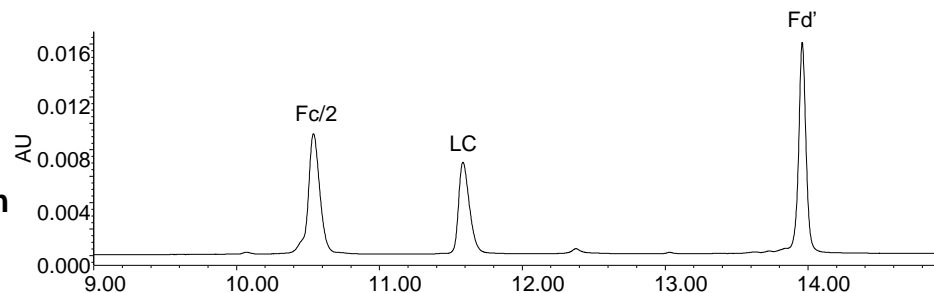


- Enhanced mAb resolution and selectivity
- Excellent reproducibility with minimal carryover
- Individually tested with mAb subunit standard

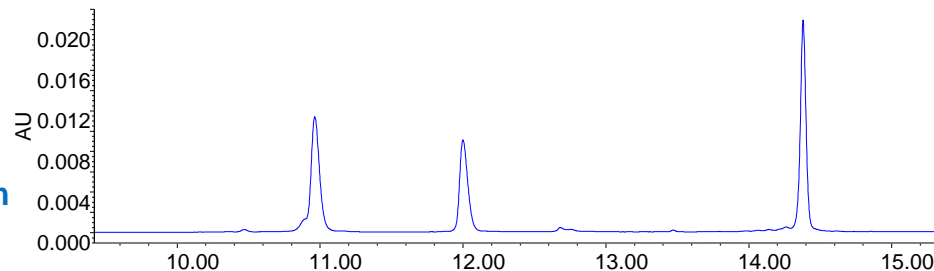


## Transferability: Alliance → Arc Bio → H-Class (60° C)

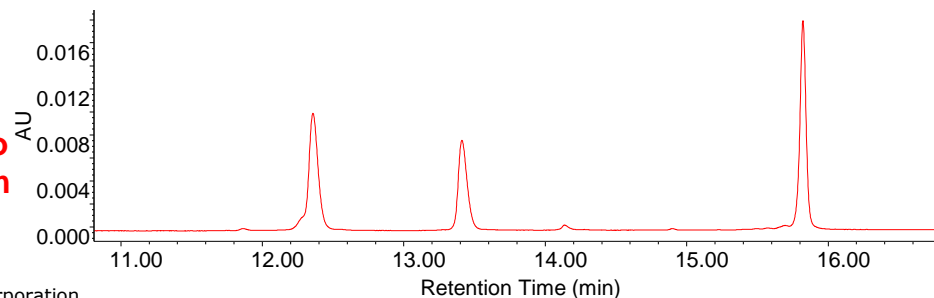
**HPLC**  
Alliance  
4.6 x 50 mm



**UHPLC**  
Arc Bio  
4.6 x 50 mm



**UPLC**  
H-Class Bio  
2.1 x 50 mm

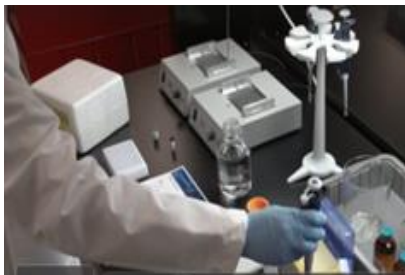


### Peak Area (%):

	Fc/2 (%)	LC (%)	Fd' (%)
Alliance	34.52	24.43	41.05
Arc Bio	34.23	24.47	41.30
H-Class Bio	34.50	24.31	41.19

**Poster P106T** A Novel Phenyl-Based RPLC Stationary Phase for High Throughput, High Resolution Characterization of Protein Therapeutics

# Sample Preparation is no longer one dimensional *for Released N-Glycan Analysis with GlycoWorks RapiFluor-MS*



Manual Prep  
8-96 samples



Low throughput  
Semi-Automation  
8-24 samples

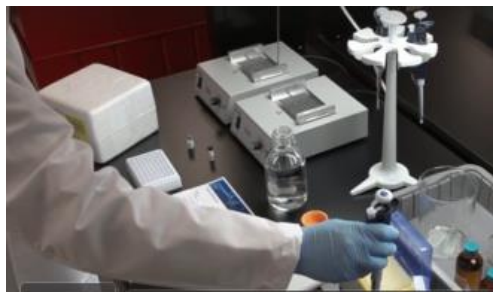


Higher throughput  
Automation  
48-96 samples

- Platform scalability for **8 to 96 samples** at a time
- **Purposefully designed kits** for manual use and automated liquid handling platforms
- Available **base scripts** and **layouts** for simplified deployment on larger bed liquid handling platforms.

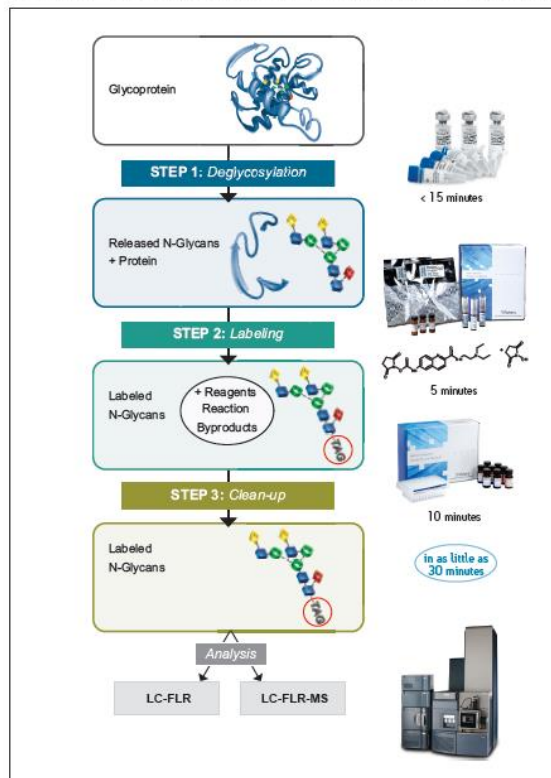
# Sample Preparation is no longer one dimensional for Released N-Glycan Analysis with GlycoWorks RapiFluor-MS

## Manual



Two kit options:  
24-sample (3 sets x 8 samples)  
96-sample (4 sets x 24 samples)

Streamlined Protocol for a Simple and Fast Sample Preparation that Minimizes Sample Handling and Loss



## Semi-Automated



Low throughput  
(8-24 samples)

# Glycan Sample Prep Automation with Andrew Alliance

- Single-channel - Lower throughput (8 - 24 samples)
- Direct transfer of current pipette based methods
- Flexible modular footprint – Only 20 lbs.
- Industry leading software provided with system
- 1/10<sup>th</sup> the cost of large bed automation platforms
- Uses standard GlycoWork *Rapi*Fluor-MS kit

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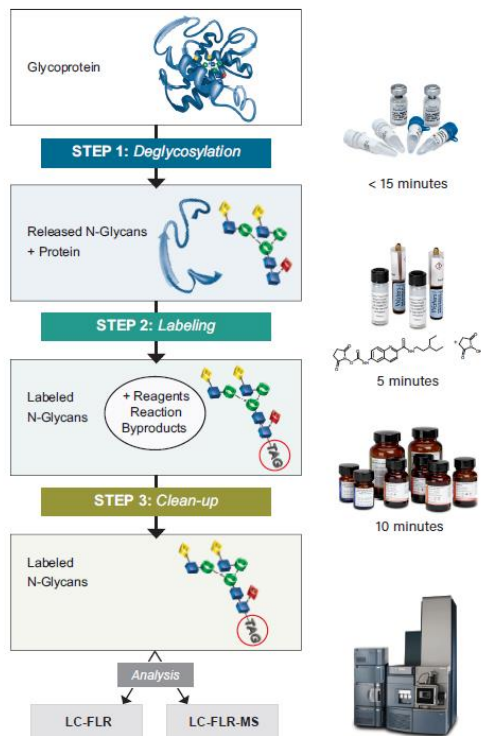
**CHECK THIS OUT!**

At the [Waters Booth](#)



# Sample Preparation is no longer one dimensional for Released N-Glycan Analysis with GlycoWorks RapiFluor-MS

Streamlined protocol for a simple and fast sample preparation  
that minimizes sample handling and loss



## Full Automation



TECAN.

HAMILTON®

- Kit Volumes adjusted for 2 x 48 or 1 x 96
- Automation Script for Tecan
- Sample Parameters Script for other platforms
- Less than 3h (96 samples with normalization)

# Released N-Glycan UPLC Analysis Workflows

# Waters

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## SAMPLE PREP

GlycoWorks RapiFluor-MS  
N-Glycan Kit



Deglycosylation, Labeling and  
Clean-up in as little as 30 min

Options for Automation

Unmatched sensitivity  
for FLR and MS detection

## SEPARATION

ACQUITY UPLC  
Glycan BEH Amide  
Column



## DETECTION & INFORMATICS



Glycan  
Monitoring

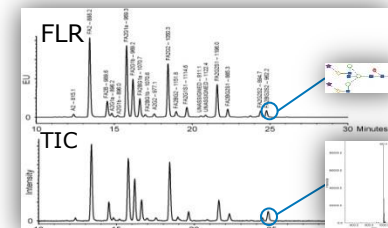
Glycan  
Characterization



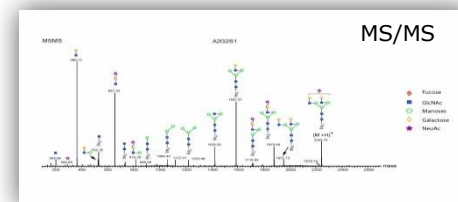
ACQUITY FLR/QDa  
and Empower 3  
Software



FLR/Xevo G2-XS QToF MS  
and UNIFI Scientific  
Information System



FLR Quantification  
GU Retention  
MS Confirmation



FLR Quantification  
GU Retention  
Accurate Mass Confirmation  
MS/MS Fragmentation



## Using LCMS to Assess and Control the Influence of Fab Glycosylation on the Pharmacological Properties of a Monoclonal Antibody

Bryan J. Harmon, PhD.

Research Fellow, Bioproduct Research and Development

Eli Lilly and Company