CRS
Leading Delivery Science and Technology

# 2017 PROGRAM

## CRS Annual Meeting & Exposition
## July 16–19
## Boston, Massachusetts, U.S.A.


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#CRSboston

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## 2017 CRS Meeting App

- Program Guide
- Abstracts
- Exposition
- Attendee List
- Personal Schedule & To-Do List
- Local Boston Attractions, Restaurants, & More!


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Username: Hynes Wireless Network
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# 2017 Annual Meeting Program Committee

*Thank you to this year's Annual Meeting Program Committee for their time and talents in planning this outstanding scientific meeting.*

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# General Meeting Information

## Share Your Photos & Experiences

**#CRSboston**

## Registration

CRS Central and self-serve check-in kiosks are located in the Sheraton Grand Ballroom Foyer on the 2nd Floor. You can modify your registration and print your badges directly at the self-serve kiosks. Name badges can only be printed once at the kiosk. CRS staff will be available at CRS Central to assist as you check-in.

***Your CRS name badge must be worn at all times in the Sheraton Boston Hotel, the Hynes Convention Center, and at all scheduled CRS events. No exceptions will be made.***

## Access the Abstracts

CRS annual meeting abstracts can easily be accessed on the CRS Meeting App. Within the app, click on the Posters icon to begin viewing poster abstracts, and view podium abstracts directly from the schedule. After the meeting, sign into the CRS website to view and search the abstracts, available to all registered attendees.

## Exposition

The Exposition is located in the Hynes Convention Center, Hall D. You can enter Hall D directly from the Sheraton Boston Hotel on the 3rd Floor. The detailed schedule of Exposition activities and descriptions of the exhibiting companies can be found via the CRS Meeting App.

## Poster Sessions

The posters are located in the Hynes Convention Center, Hall D. Details on when poster authors will be present can be found via the CRS Meeting App. All posters must be removed during Poster Take-Down or they will be discarded. The poster viewing area will be secured overnight. Photographing posters is not permitted.

## Speaker Kiosk

The Speaker Kiosk will be available for speakers to upload and preview their presentations the day before their scheduled session (e.g., if you speak on Monday, July 17, you will upload your presentation at the kiosk on Sunday, July 16). Presenters are not allowed to use their own laptops to give their presentations. The Speaker Kiosk is located at CRS Central in the Sheraton Grand Ballroom Foyer on the 2nd Floor.

## Get Social!

Follow and join our social media groups so you can connect now and after the meeting.

- On Twitter? Use #CRSboston throughout the meeting and follow @crsscience
- *Like* Controlled Release Society on Facebook
- Follow Controlled Release Society on LinkedIn

**CRS is now on Snapchat! Download the app and search for @crsscience**

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## Electronic Devices

As a courtesy to other meeting attendees, please turn off or silence all electronic devices during all workshops, sessions, and presentations.

## Photography

Photography is not permitted in the session rooms, exhibit hall, or poster sessions.

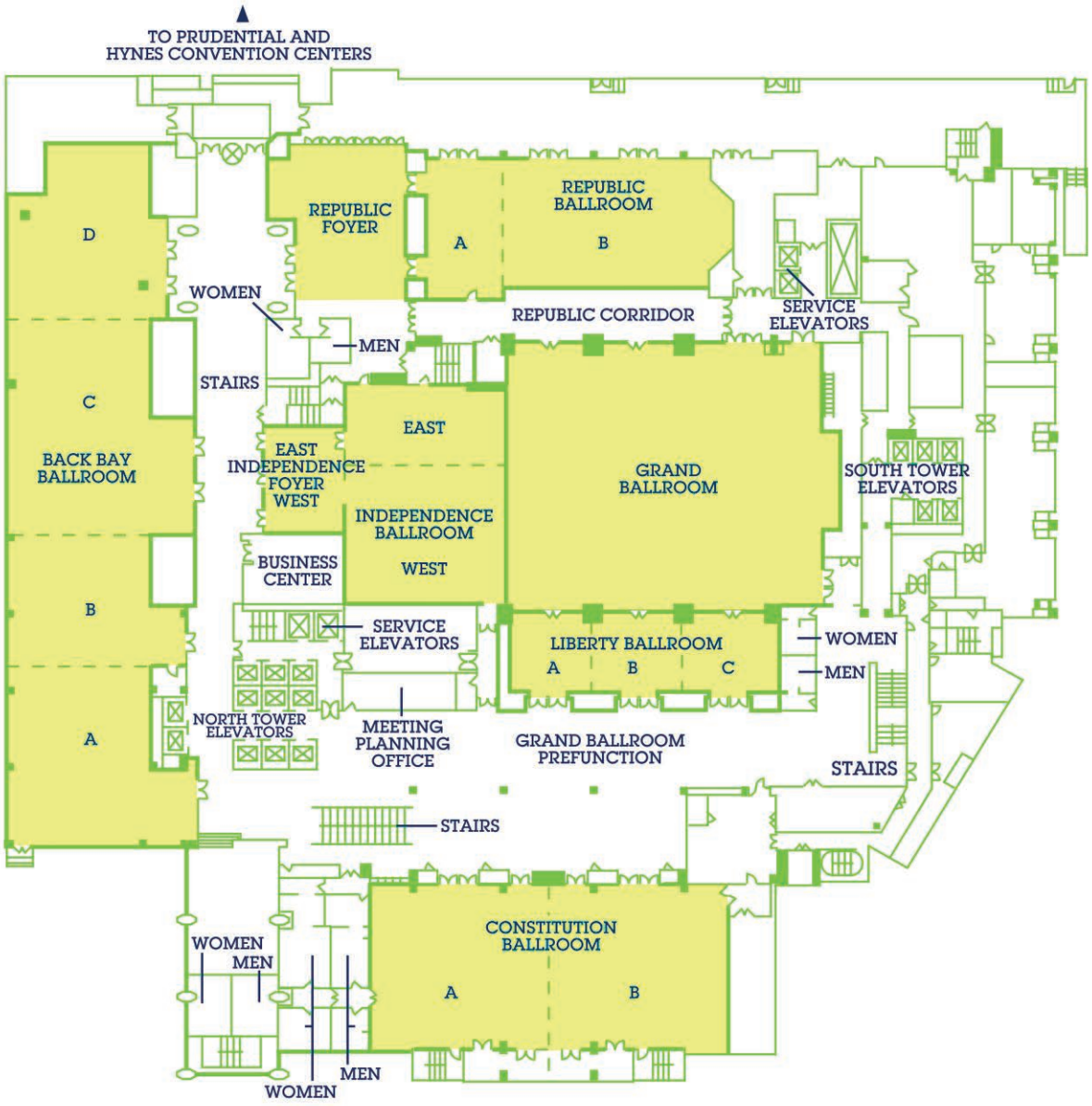
## Photo Release

By virtue of your attendance, you agree to the Controlled Release Society's use of your likeness in promotional media.

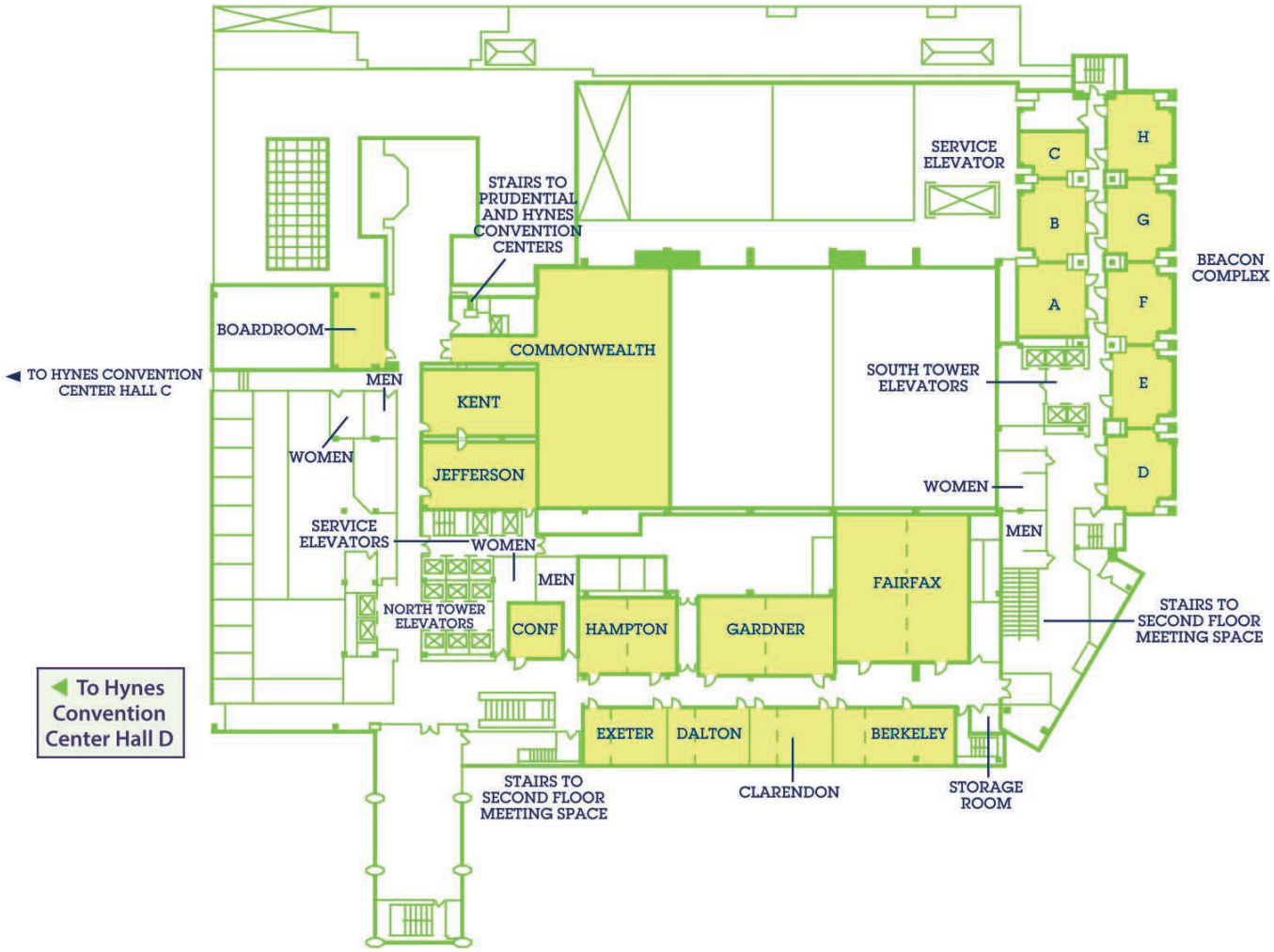
## Children and the CRS Annual Meeting & Exposition

The CRS Annual Meeting & Exposition is a professional, scientific meeting. CRS does not permit anyone under the age of 18 to attend the scientific sessions, poster sessions, exposition, and social events. For safety reasons, only registered exhibitors and poster presenters are permitted in the exposition/poster hall during set-up and take-down hours. Anyone 18+ must register and buy applicable individual tickets if not attending/registering as a student.

# Sheraton Boston Second Floor

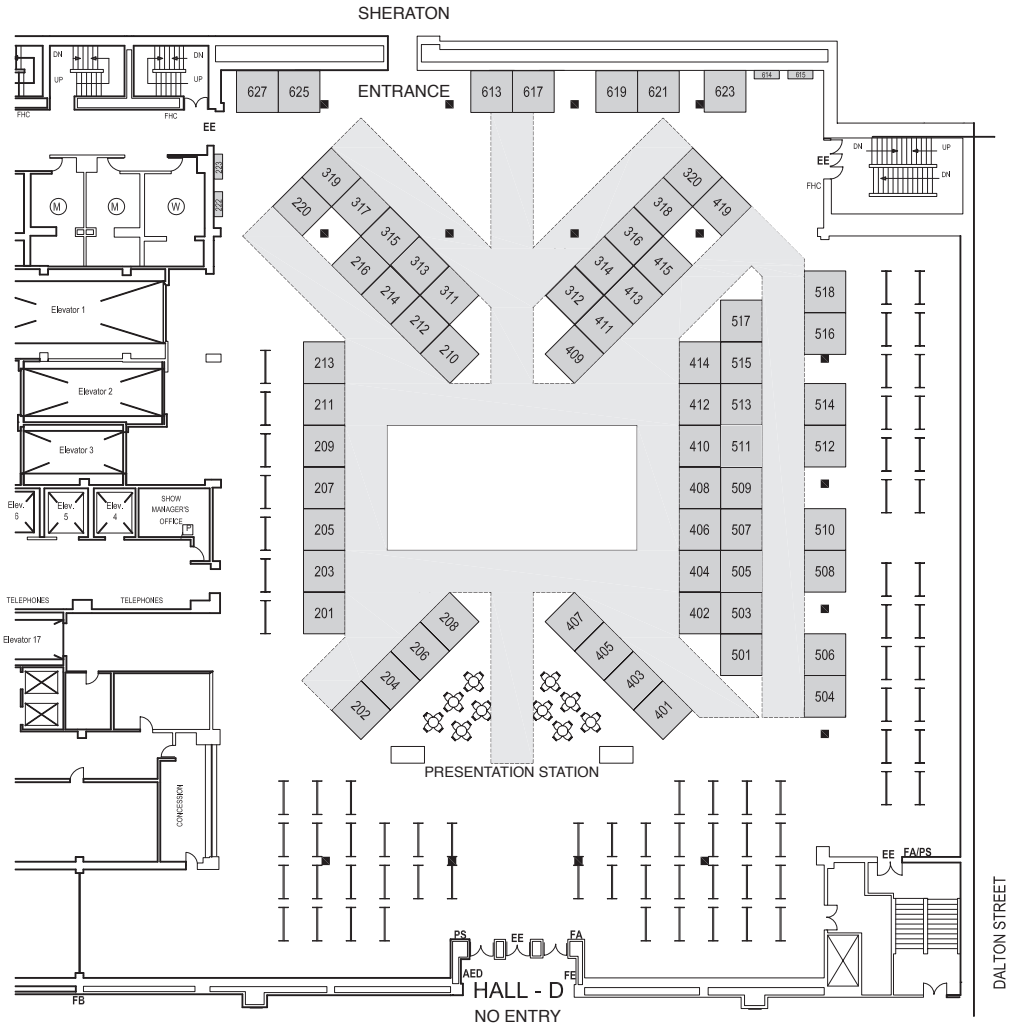


# Sheraton Boston Third Floor



# Hynes Convention Center – Exposition Hall



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# Saturday, July 15

## Schedule-at-a-Glance

| | |
|---|---|
| 8:00 a.m. – 5:00 p.m. | CRS Board of Directors Meeting • Gardner |
| 8:00 a.m. – 5:00 p.m. | Exposition Set-Up • Hall D |
| 12:00 – 4:30 p.m. | Speaker Kiosk Open • Grand Ballroom Foyer |
| 12:00 – 5:00 p.m. | CRS Registration Open • Grand Ballroom Foyer |

## Program Highlights

### Premeeting Workshops*

**Novel Delivery Platforms: Penetration Transdermal Delivery Systems and Oral Delivery Systems***
8:00 a.m. – 1:30 p.m. • Back Bay A

*Sponsored by* CHEMISTRY HOLDINGS

**Basic Concepts of Oral Drug Delivery: What You Need to Know***
9:00 a.m. – 5:00 p.m. • Back Bay C

*Sponsored by* Colorcon Innopharma technology

### Field Trips

**Follow JFK's Historical Footsteps through Harvard University, the MIT Museum, and the John F. Kennedy Library and Museum***
9:00 a.m. – 4:00 p.m. • Check-in for tour in the hotel lobby at 8:45 a.m.

**Experience Boston's Freedom Trail***
1:00 – 4:00 p.m. • Check-in for tour in the hotel lobby at 12:45 p.m.

### Young Scientist Programming

**Scientific Workshop: Entrepreneurship and What You Need to Know**
1:00 – 5:00 p.m. • Fairfax

**Additional registration, payment, and ticket required*

# Sunday, July 16

## Schedule-at-a-Glance

| | |
|---|---|
| 7:30 a.m. – 6:00 p.m. | Speaker Kiosk Open • Grand Ballroom Foyer |
| 7:30 a.m. – 6:30 p.m. | CRS Registration Open • Grand Ballroom Foyer |
| 8:00 – 11:00 a.m. | CRS Board of Directors Meeting • Gardner |
| 8:00 a.m. – 2:00 p.m. | Exposition Set-Up • Hall D |
| 9:00 a.m. – 1:00 p.m. | Technology Forums |
| 1:30 – 2:00 p.m. | Opening Session and Award Ceremony • Grand/Liberty Ballroom |
| 2:00 – 3:00 p.m. | Plenary Session – Robert Langer • Grand/Liberty Ballroom |
| 3:00 – 4:00 p.m. | CRS Chapter Networking Break • Back Bay B |
| 4:30 – 6:30 p.m. | Exposition Grand Opening & Welcome Reception • Hall D |

## Program Highlights

### Premeeting Workshops*

**Enabling Successful Liposomal Formulation from Scratch–Lipid Synthesis, CMC, Regulatory, and Case Study***
8:00 a.m. – 1:00 p.m. • Back Bay A

*Sponsored by* MilliporeSigma, POLYMUN SCIENTIFIC

**Start Earlier, Move Faster: Smart Drug Development & Design from Candidate to Phase I***
8:00 a.m. – 1:00 p.m. • Back Bay C

*Sponsored by* Catalent

### Young Scientist Programming

**Professional Development Workshop: Gaining Your Career Edge – CV and Interview Techniques**
9:00 a.m. – 12:00 p.m. • Fairfax

**Young Scientist Meet & Greet**
12:00 – 1:00 p.m. • Back Bay B

**Robert Langer Student Meet & Greet**
1:00 – 1:30 p.m. • Back Bay B

### Plenary Session

**Controlled Drug Delivery Systems and the Creation of New Medical Treatments**
2:00 – 3:00 p.m. • Grand/Liberty Ballroom

**Robert Langer**
Massachusetts Institute of Technology, U.S.A.

### Industry Roundtable

**Running with Your Idea: How to Successfully Navigate Your Start-Up**
3:00 – 4:30 p.m. • Grand/Liberty Ballroom A

*Sponsored by* Pfizer

### Other Program Highlights

**Opening Session and Awards Ceremony**
1:30 – 2:00 p.m. • Grand/Liberty Ballroom

**Exposition Grand Opening and Welcome Reception**
4:30 – 6:30 p.m. • Hall D

*Sponsored by* LACTEL Absorbable Polymers

**Preclinical Sciences & Animal Health (PSAH) Networking Event***
8:00 – 9:30 p.m. • Back Bay D

**Additional registration, payment, and ticket required*

# Technology Forums

Open to all registered attendees on a complimentary basis, these forums offer in-depth coverage of technologies and services hosted by the presenting companies. Detailed descriptions of the individual forums can be found on the CRS Meeting App.

**The Patient Perspective – Avenues to Better Success in Late Phase Clinical Studies and Validated Patient Data**
9:00 – 10:00 a.m. • Beacon D

**What You Should Know About Lipid-Based Formulations: Oral Delivery of Peptides**
9:00 – 10:00 a.m. • Beacon E

**High-Throughput or Well-Characterized? Light Scattering Tools for Rapid Screening and Deep Characterization of Therapeutic Nanoparticles**
9:00 – 10:00 a.m. • Beacon F

**AFFINISOL™ Innovative Polymer Solutions for Solubility**
9:00 – 10:00 a.m. • Beacon G

**The Role Liposomes, Nanoparticles, and Microparticles Play in Parenteral Drug Delivery and Patient Care**
10:30 – 11:30 a.m. • Beacon D

**Silicones for Controlled Release Applications**
10:30 – 11:30 a.m. • Beacon E

**How to Better Control Pellet Production Processes Through Counting**
10:30 – 11:30 a.m. • Beacon F

**Preclinical Strategies for Differentiated Drug Product Development**
12:00 – 1:00 p.m. • Beacon D

**EUDRATEC®: Innovative Formulation Technologies for Advanced Oral Drug Delivery**
12:00 – 1:00 p.m. • Beacon E

**Changing the Culture of Dissolution Qualification**
12:00 – 1:00 p.m. • Beacon F

# Scientific Program • Monday 8:30 – 10:00 a.m.



## Grand/Liberty Ballroom

### Biologically Active Excipients and Carriers

**Moderator:** Alexander Florence
**Chair:** Anthony Kim

**8:35 a.m. 3**
*Liposome-Supported Peritoneal Dialysis for the Treatment of Hyperammonemia-Associated Encephalopathy*
**Jean-Christophe Leroux**, ETH Zurich, Switzerland

**9:00 a.m. 4**
*Polymers as Drugs: The Development of Patiromer for Lowering Serum Potassium Concentration in Patients with Hyperkalemia*
**Derek Maclean**, Relypsa, U.S.A.

**9:25 a.m. 31**
*Sucrose Laurate is an Effective Permeation Enhancer for Insulin: Rat Intestinal Instillations*
**Fiona McCartney**, University College Dublin, Ireland

**9:33 a.m. 32**
*ROS-Mediated Cancer Therapy Using Hydrophilized Au-TiO2 Nanocomposites as Sonodynamic Agents*
**Deepagan Veerasikku Gopal**, Sungkyunkwan University, South Korea

**9:41 a.m. 33**
*A hyaluronic acid-based hydrogel enabling CD44-mediated cell binding and gene silencing for osteoarthritis treatment*
**Yunpeng Cai**, iNANO, Aarhus University, Denmark

**9:49 a.m. 34**
*Role of Atorvastatin on Regulation of Transforming Growth Factor-Beta Expression in Periodontal Inflammation*
**Sevda Şenel**, Hacettepe University, Turkey

## Constitution Ballroom

### Improving *in Vitro* Methodologies, Predicting Outcomes

**Moderator:** Diane Burgess
**Chair:** Jie Shen

**8:35 a.m. 15**
*High-Throughput In-Vitro Screening of Surfactants and Surfactant-based Nanomedicines for their Biological Action*
**Yvonne Perrie**, University of Strathclyde, United Kingdom

**9:00 a.m. 16**
*Abstract not available*
**Roger Gilabert-Oriol**, BC Cancer Research Center, Canada

**9:25 a.m. 55**
*Whole-Tablet Dissolution Imaging of Voltaren®* Immediate and Delayed-Release Tablets
**Jesper Ostergaard**, University of Copenhagen, Denmark

**9:33 a.m. 56**
*Development of Methodologies for High Content, Label Free Time Lapse Monitoring of the Effects of "Smart" Nano-Particle Formulations, Using Kolmogorov-Smirnov Based Multiple Sample Comparative Evaluations*
**Ed Luther**, Northeastern University, U.S.A.

**9:41 a.m. 57**
*The Development of a Tissue-engineered Tracheobronchial in Vitro Co-culture Model Using Bilayered Collagen-Hyaluronate (CHyA-B) Scaffolds: A Platform for Predicting Outcomes in Respiratory Drug Development*
**Cian O'Leary**, Royal College of Surgeons, Ireland

**9:49 a.m. 58**
*Evaluation of Correlation between Drug Flux across Caco-2 Monolayers Using IDAS and Drug Absorption (in vivo) from Various Oral Formulations of Atenolol, Minoxidil and Danazol*
**Svitlana Silchenko**, Absorption Systems, U.S.A.

## Republic Ballroom

### Intracellular Drug Delivery Symposium

**Moderator:** Mauro Ferrari

The delivery of therapeutic agents directly to specific cellular organelles can dramatically increase therapeutic efficacy. In most cases, however, the distribution of therapeutics inside cells and to their intracellular targets remains a formidable challenge. The main barrier to intracellular delivery is the translocation of therapeutic molecules across the cell membrane, and ultimately through the membranes of their target intracellular organelles. Another prerequisite for efficient intracellular localization of active molecules is their escape from the endocytic pathway. Pharmaceutical nanocarriers can be engineered with both intracellular and organelle-specific targeting moieties to deliver encapsulated or conjugated cargo to specific subcellular targets. The advent of novel nanocarriers and targeting ligands as well as the exploration of alternate routes for intracellular delivery and targeting have prompted extensive research and promise an exciting future for this field.

**8:30 a.m.**
*Post Nanomedicine*
**Mauro Ferrari**, Houston Methodist, U.S.A.

**9:00 a.m.**
*In vitro and ex vivo strategies for intracellular delivery*
**Klavs Jensen**, MIT, U.S.A.

**9:30 a.m.**
*Biological Mechanistics of Intracellular Drug Delivery*
**Silvia Muro,** University of Maryland, U.S.A.

**Independence Ballroom**

**New Advances in Lipid-Based Drug Delivery to Meet Advanced Industry and Patient Needs Industry Roundtable**

*Sponsored by*

Capsugel®

**Moderator:** Hassan Benameur, Capsugel

Lipid-based drug delivery systems (LBDDS) have a long history in oral drug delivery, particularly for boosting absorption of poorly soluble drugs. More recently, there has been growing pharma pipeline demands for technologies that address the "next" barriers to oral bioavailability. This session highlights lipid-based drug delivery systems (LBDDS), with academic and industry experts to cover advances in these areas. The speakers will discuss how LBDDS can aid delivery of drugs showing low permeability, high first-pass metabolism, and high melting point, and how industry is bringing the advantages of LBBDS to wider patient-groups, including the elderly and children.

**Speakers:**
**Brett Waybrant**, Bend Research/ Capsugel
**Chris Porter**, Monash Institute of Pharmaceutical Sciences
**David Brayden**, University College Dublin
**Hywel Williams**, Capsugel R&D
**Neil Mathias**, Bristol-Myers Squibb

## Schedule-at-a-Glance

| | |
|---|---|
| 7:30 – 8:30 a.m. | Poster Set-Up, Groups A & B • Hall D |
| 7:30 a.m. – 5:00 p.m. | Speaker Kiosk Open • Grand Ballroom Foyer |
| 7:30 a.m. – 5:30 p.m. | CRS Registration Open • Grand Ballroom Foyer |
| 8:00 – 8:30 a.m. | CRS *Newsletter* Committee Meeting • Beacon E |
| 8:30 – 10:00 a.m. | Poster Viewing, Groups A & B • Hall D |
| 8:30 – 10:00 a.m. | Scientific Sessions and Industry Roundtable |
| 10:15 – 11:15 a.m. | Plenary Session – Henry Brem • Grand/ Liberty Ballroom |
| 11:15 a.m. – 1:00 p.m. | Exposition (w/lunch*) • Hall D<br>Poster Viewing, Groups A & B • Hall D |

## Program Highlights

### Industry Roundtable

**New Advances in Lipid-Based Drug Delivery to Meet Advanced Industry and Patient Needs**
8:30 – 10:00 a.m. • Independence Ballroom

*Sponsored by* Capsugel®

### Plenary Session

**The Changing Role of Drug Delivery in Brain Tumor Therapy**
10:15 – 11:15 a.m. • Grand/Liberty Ballroom

**Henry Brem**
Johns Hopkins University, U.S.A.

### Young Scientist Programming

**Start with a Luminary***
7:00 – 8:15 a.m. • Beacon B

**CV on a Poster**
11:15 a.m. – 12:00 p.m. • Hall D

**Additional registration, payment, and/or ticket required*

# Scientific Program • Monday 1:15 – 2:45 p.m.



## Grand/Liberty Ballroom

### New Directions for Polymers in Drug Delivery

**Moderator:** Edith Mathiowitz
**Chair:** Jung Soo Suk

**1:20 p.m. 21**
*The Promise of New Intelligent and Recognitive Carriers for Better Drug Delivery*
**Nicholas Peppas**, University of Texas at Austin, U.S.A.

**1:45 p.m. 22**
*Solving Drug Delivery Problems by Genetically Engineered Nanoparticles*
**Ashutosh Chilkoti**, Duke University, U.S.A.

**2:10 p.m. 67**
*Multiple Hyperthermia-controlled Release of TRAIL/SPION Nanocomplex from Thermosensitive Polymeric Hydrogels for Combination Cancer Therapy*
**Zhi-Qiang Zhang**, Korea Institute of Science and Technology, South Korea

**2:18 p.m. 68**
*The Development of Gene Activated Scaffolds for Tissue Engineering Using Star-Shaped Polypeptides*
**David Walsh,** Royal College of Surgeons, Ireland

**2:26 p.m. 69**
*Polycationic Excipients for Single-Administration Inactivated Polio Vaccine*
**Stephany Tzeng**, Massachusetts Institute of Technology, U.S.A.

**2:34 p.m. 70**
*Co-delivery of Disease Associated Peptide and Immune Suppressing Agent via Acetalated Dextran Microparticles for Treatment of Multiple Sclerosis*
**Naihan Chen**, The University of North Carolina at Chapel Hill, U.S.A.

## Constitution Ballroom

### Advances in Manufacture, Characterization, Stability, and Regulation

**Moderator:** Yabin Lei
**Chair:** Kenneth Carson

**1:20 p.m. 1**
*State of the Art Manufacturing and Characterization of Complex Parenteral Dosage Forms*
**Diane Burgess**, University of Connecticut, U.S.A.

**1:45 p.m. 2**
*Regulatory Considerations for the Development of Generic Modified Release Drug Products using Fluid Bed Technology*
**Yue (Helen) Teng,** FDA, U.S.A.

**2:10 p.m. 27**
*Protein-polysaccharide Complexes for Improved Protein Delivery within Calcium Carbonate Microparticles*
**Bathabile Ramalapa**, University of Angers, France

**2:18 p.m. 28**
*Rapid On-Site Manufacturing Approach of 3D Printed Controlled Release Pills: 4D Capsules*
**Derrick Smith**, Merck Research Laboratories, U.S.A.

**2:26 p.m. 29**
*In Vitro Characterization of Lutein-Loaded Liposomes Prepared Using Supercritical Carbon Dioxide*
**Lisha Zhao**, University of Alberta, Canada

**2:34 p.m. 30**
*A New Approach for the Treatment of Ophthalmic Inflammation: Sustained Controlled Release of Dexamethasone Loaded Polylactic Acid Microspheres*
**Celia Castaneda**, Midatech Pharma (Wales), United Kingdom

## Republic Ballroom

### Cell Therapies

**Moderator:** David Thompson
**Chair:** Cathal Kearney

**1:20 p.m. 5**
*Abstract not available*
**Kristy Wood**, Intellia Therapeutics Inc., U.S.A.

**1:45 p.m. 6**
*Development of Hydrogel Carriers and Delivery Systems to Improve Cellular Retention for Cardiovascular Regeneration*
**Garry Duffy,** Royal College of Surgeons, Ireland

**2:10 p.m. 35**
*Feasible and Effective Stem Cell Therapies for Enhanced Articular Cartilage Restoration*
**Hee Jung Kim**, Ewha Woman's University, South Korea

**2:18 p.m. 36**
*In situ Activation of Platelets with Checkpoint Inhibitors for Post-surgical Cancer Immunotherapy*
**Chao Wang**, North Carolina State University, U.S.A.

**2:26 p.m. 37**
*Immunogenically Dying Tumor Cells Designed to Release Immunostimulatory Ligands for New Cancer Immuno-chemotherapy*
**Yuchen Fan**, University of Michigan, U.S.A.

**2:34 p.m. 38**
*Immune Modulatory Biomaterials for Cell-Based Therapies*
**Omid Veiseh**, Rice University, U.S.A.

**Independence Ballroom**

**Industry Roundtables**

### Drug Delivery 2017: The Path Ahead

1:15 – 2:45 p.m.

*Sponsored by* Catalent

**Moderator:** Claus-Michael Lehr, Saarland University

A diverse panel of experts from industry and academia will assess the current state of the small and large molecule drug delivery field, including formulation, dose forms, CMC, and devices. The panel will discuss strategies and approaches that are or are not working today, where further innovation is needed, and the evolving perspectives of different stakeholders (pharma, academia, regulators, patients, providers, and payers).

**Invited Speakers**
**Jim Spavins**, Spavins Consulting
**Cornell Stamoran**, Catalent Pharma Solutions
**Randy Mrsny**, University of Bath
**Debra Bingham**, Valeo Partners

### New Methods to Mitigate Risks During Development

4:15 – 5:45 p.m.

*Sponsored by* CAMBRIDGE DESIGN PARTNERSHIP

**Moderator:** Uri Baruch, Cambridge Design Partnership

This session will focus on how we can mitigate risk early in the development cycle by using new technologies and learning from other business sectors. It will explore new methods that can provide insights into issues related to therapeutic effects, adherence, and user preferences, while also creating a shared view of the product profile across a diverse organization.

## Schedule-at-a-Glance

| | |
|---|---|
| 12:30 – 1:00 p.m. | Poster Huddles • Hall D |
| 1:15 – 2:45 p.m. | Scientific Sessions and Industry Roundtable |
| 2:45 – 4:00 p.m. | Exposition and Poster Session, Groups A & B • Hall D |
| 3:00 – 3:30 p.m. | Poster Authors Present – Group A • Hall D |
| 3:30 – 4:00 p.m. | Poster Authors Present – Group B • Hall D |
| 4:00 – 4:15 p.m. | Poster Take-Down – Groups A & B • Hall D |
| 4:00 – 5:00 p.m. | Preclinical Sciences & Animal Health Division Meeting • Constitution Ballroom |

## Program Highlights

### Poster Huddles

12:30 – 1:00 p.m. • Hall D

*Sponsored by* MERCK INVENTING FOR LIFE

Poster Huddles will feature posters that were selected to receive the Graduate Research Advances in Delivery Science (GRADS) awards, sponsored by Merck & Co. The Poster Huddles will offer more in-depth discussion of research and findings presented by poster authors.

### Industry Roundtables

**Drug Delivery 2017: The Path Ahead**
1:15 – 2:45 p.m. • Independence Ballroom

*Sponsored by* Catalent

**New Methods to Mitigate Risks During Development**
4:15 – 5:45 p.m. • Independence Ballroom

*Sponsored by* CAMBRIDGE DESIGN PARTNERSHIP

### Other Highlighted Event

**Young Scientist Networking Event**
5:30 – 6:30 p.m. • Loretta's Last Call (offsite)

# Scientific Program • Tuesday 8:30 – 10:00 a.m.



## Grand/Liberty Ballroom

### Delivery Technologies in Nutraceuticals, Foods, and Oral Products

**Moderator:** Rebecca Carrier
**Chair:** Teresa Virgallito

**8:35 a.m. 11**
*Abstract not available*
**Jingjun (Jim) Huang**, Ascendia Pharmaceuticals, U.S.A

**9:00 a.m. 12**
*Lactoferrin Oral Delivery: Legendary Marketing Claims Significant Challenges*
**Jingyuan Wen,** University of Auckland, New Zealand

**9:25 a.m. 47**
*Solubility Enhancement and Rapid Release of Resveratrol by Nanocomplexation with Soy Protein Isolate*
**Naisarg Pujara**, University of Queensland, Australia

**9:33 a.m. 48**
*Oral Capsular Systems for Pulsatile Release of Dietary Supplements*
**Alice Melocchi,** Università degli Studi di Milano, Italy

**9:41 a.m. 49**
*Delivery of Lethal dsRNAs in Insect Diets by Branched Amphiphilic Peptide Capsules*
**Adriana Avila Flores**, Auburn University, U.S.A.

**9:49 a.m. 50**
*FCC – a new functional calcium carbonate-based carrier material for encapsulation of flavouring compounds and nutraceuticals*
**Anna Millqvist Fureby**, RISE Research Institutes of Sweden, Sweden

## Constitution Ballroom

### Modeling and Simulation: Interplay of Animal and Human Pharmaceutical Development

**Moderator:** Praveen Hiremath
**Chair:** Thierry Vandamme

**8:35 a.m. 19**
*Can Modeling Facilitate Interspecies Extrapolation of PK Data? Identifying Potential Limitations of PK Data Alone*
**Marilyn Martinez**, FDA Center for Veterinary Medicine, U.S.A.
**Devendra Pade**, Simcyp (a Certara Company), United Kingdom

**9:00 a.m. 20**
*Formulation-dependent Dog PK/PD Study and PBPK Modeling for Human Prediction*
**Wen Lin,** Novartis, U.S.A.

**9:25 a.m. 63**
*Development of In Vitro-In Vivo Correlation of Parenteral Naltrexone Loaded Polymeric Microspheres*
**Janki Andhariya**, University of Connecticut, U.S.A.

**9:33 a.m. 65**
*Investigation Molecular Dissolution Mechanism of Ketoprofen Ternary Solid Dispersions with Different Surfactants by Molecular Dynamics Simulations*
**Defang Ouyang**, University of Macau, China

**9:41 a.m. 66**
*Mechanistic Pharmacokinetic/ Pharmacodynamic (PK/PD) Modelling of Inhaled Colistin in Mouse Lung Infection Model*
**Yu-Wei Lin**, University of Sydney, Australia

**9:49 a.m.**
Moderated Discussion

## Republic Ballroom

### Natural Structures as Drug Carriers Symposium

**Moderator:** Raymond Schiffelers

Natural structures, such as cells, exosomes, and lipoproteins, can transport a broad variety of substances in the body for effective delivery to their required locations. Due to their size, biocompatibility, and long time in the circulation, these natural structures are considered good candidates for drug delivery. Exosomes, natural and reconstituted lipoproteins, and certain cells are being actively evaluated as promising drug delivery vehicles and dosage forms. These structures have a good loading capacity, can be additionally modified to impart targetability and other useful properties, and are amenable to receptor-mediated uptake by target cells. The latest developments in this challenging and promising area will be discussed at this session.

**8:30 a.m.**
*Exosomes versus Liposomes*
**Raymond Schiffelers**, University Medical Center Utrecht, The Netherlands

**9:00 a.m.**
*Red Blood Cell-based Delivery of Drugs and Contrasting Agents*
**Mauro Magnani**, Università degli Studi di Urbino Carlo Bo, Italy

**9:30 a.m.**
*The Place of Lipoproteins in the Drug Delivery Spectrum*
**Andras Lacko**, UNT Health Science Center, U.S.A.

**Independence Ballroom**

**Patient Advocacy and Engagement Industry Roundtable**

**Moderator:** Keith Horspool, Boehringer Ingelheim

This session will focus on patient advocacy and engagement from the perspectives of patients, patient advocacy organizations, and companies involved with pharmaceutical development. Our panelists will explore a broad range of experiences they've personally experienced or encountered, discussing how drug delivery and development scientists can better partner with patients to best meet their needs.

**Panelists:**
**Mary Suzanne 'Suz' Schrandt**, Arthritis Foundation
**Nicole Rioles**, T1D Exchange
**Rubi Burlage**, Merck
**Matt Burke**, GSK

## Schedule-at-a-Glance

| | |
|---|---|
| 7:00 – 8:00 a.m. | CRS Finance Committee Meeting • Beacon F |
| 7:00 – 8:00 a.m. | Board of Scientific Advisors Meeting • Beacon E |
| 7:00 – 8:00 a.m. | Consumer & Diversified Products Committee Meeting • Beacon D |
| 7:30 – 8:30 a.m. | Poster Set-Up, Groups C & D • Hall D |
| 7:30 a.m. – 4:30 p.m. | Speaker Kiosk Open • Grand Ballroom Foyer |
| 7:30 a.m. – 5:00 p.m. | CRS Registration Open • Grand Ballroom Foyer |
| 8:30 – 10:00 a.m. | Scientific Sessions and Industry Roundtable |
| 8:30 – 11:15 a.m. | Poster Viewing, Groups C & D • Hall D |
| 10:00 – 11:15 a.m. | Exposition • Hall D |
| 10:30 – 11:00 a.m. | Poster Huddles • Hall D |
| 11:15 a.m. – 12:15 p.m. | Plenary Session – Amar Sawhney • Grand/Liberty Ballroom |

## Program Highlights

### Industry Roundtable

**Patient Advocacy and Engagement**

8:30 – 10:00 a.m. • Independence Ballroom

### Poster Huddles

10:30 – 11:00 a.m. • Hall D

*Sponsored by* MERCK INVENTING FOR LIFE

Poster Huddles will feature posters that were selected to receive the Graduate Research Advances in Delivery Science (GRADS) awards, sponsored by Merck & Co. The Poster Huddles will offer more in-depth discussion of research and findings presented by poster authors.

### Plenary Session

**Crosslinked PEG Hydrogels: A Versatile Family of Biomaterials and Their Application in Ocular Drug Delivery**
11:15 a.m. – 12:15 p.m. • Grand/Liberty Ballroom

**Amar Sawhney**
Ocular Therapeutix, Inc., U.S.A.

# Scientific Program • Tuesday 1:30 – 3:00 p.m.



## Grand/Liberty Ballroom

### Delivery of Complex and Labile Molecules

**Moderator:** Steven Schwendeman
**Chair:** Randy Mrsny

**1:35 p.m. 7**
*Single Injection Vaccines – Pulsatile Release and Stability*
**Ana Jaklenec,** MIT, U.S.A.

**2:00 p.m. 8**
*Use of* in Vitro *Models to Improve the* in Vivo *Stability of Therapeutic Molecules Formulated For Long-acting Delivery*
**Ann Daugherty,** Genentech, U.S.A.

**2:25 p.m. 39**
*Non-viral CRISPR/Cas Gene Editing* in Vitro *and* in Vivo *Enabled By Co-delivery of mRNA and sgRNA Inside of Synthetic Lipid Nanoparticles*
**Daniel Siegwart**, University of Texas Southwestern Medical Center, U.S.A.

**2:33 p.m. 40**
*Percutaneous Intramyocardial Injection of Microencapsulated NRG1 and FGF1 Induce Cardiac Repair in a Porcine Model of Myocardial Infarction*
**Elisa Garbayo**, University of Navarra, Spain

**2:41 p.m. 41**
*Development of Novel Nano-biotechnology Tools Targeting Opioid Receptors*
**Jiao Feng,** Université Paris Saclay, France

**2:49 p.m. 42**
*Controlling the Long-range Inter-nanofibril Interaction to Regulate the Stability and Function of Peptide/DNA Co-assembled Nanococoons*
**Rong Ni**, The Hong Kong University of Science and Technology, Hong Kong

## Constitution Ballroom

### Encapsulation and Controlled Release for Industrial Applications

**Moderator:** Jeff Wu
**Chair:** James Oxley

**1:35 p.m. 13**
*Encapsulation & Controlled Release Technologies Use in Coatings & Consumer Products*
**Christopher Tucker**, The Dow Chemical Company, U.S.A.

**2:00 p.m. 14**
*Interrogating mRNA delivery: From Whole Animals to Single Cells*
**Phil Santangelo,** Georgia Institute of Technology and Emory University, U.S.A.

**2:25 p.m. 51**
*Synthetic, 2D Lamellar Hydroxides as Novel Controlled Release Materials for Topical Applications*
**Stephen Hussey**, Anton Paar, U.S.A.

**2:33 p.m. 52**
*Encapsulation of Bleach Activator for Use in Liquid Laundry Detergents*
**Liang Chen**, The Dow Chemical Company, U.S.A.

**2:41 p.m. 53**
*Development of Tioconazole Vaginal Implants Prepared by Hot-Melt Extrusion*
**Seda Rençber**, Ega University, Turkey

**2:49 p.m. 54**
*Permanent Encapsulation and Triggered Release of Small, Volatile Fragrance Oils for Perfume Applications*
**Olivier Cayre**, University of Leeds, United Kingdom

## Republic Ballroom

### Ocular Drug Delivery

**Moderator:** Laura Ensign
**Chair:** Ian Pitha

**1:35**
*Abstract not available*
**Justin Hanes,** Johns Hopkins University, U.S.A.

**2:00 p.m. 24**
*Targeted Delivery of Drugs to Posterior Segment of the Eye*
**Eliana Souto**, University of Coimbra, Portugal

**2:25 p.m. 71**
*High-density Lipoprotein Nanocarriers for Posterior Ocular Diseases*
**Tatsuya Murakami**, Toyama Prefectural University, Japan

**2:33 p.m. 72**
*Inhibition of Corneal Neovascularization by Dexamethasone-Eluting Contact Lenses in a Rabbit Model*
**Lokendrakumar Bengani**, Schepens Eye Research Institute, U.S.A.

**2:41 p.m. 73**
*Release of Avastin from Polysaccharides Based In Situ Hydrogel and its Therapeutic Effect on Recurrent Choroidal Neovascularization Model in Monkey Eyes*
**Yu Yu**, The Hong Kong University of Science and Technology, Hong Kong

**2:49 p.m. 74**
*Stochastic Modeling of Macromolecular Therapeutics Delivery from Hydrolytically Degradable Intracocular Hydrogel Depot*
**Ghodsiehsadat Jahanmir**, The Hong Kong University of Science and Technology, Hong Kong

**Independence Ballroom**

**Enabling Successful Delivery of Lifecycle Management Strategies through Effective Collaboration Industry Roundtable**

*Sponsored by*

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**Moderator:** Anil Kane

Lifecycle management (LCM) is one of the major strategies used in the pharmaceutical industry owing to several factors such as the patent expiry of major blockbuster drugs in the coming 5–10 years, stiffer competition in the market due to the presence of generic players and, a drought in the pharmaceutical R & D pipeline. Controlled release dosage forms, fixed dose combinations (FDC's) and pediatrics are some of the leading LCM strategies adopted by the industry. Emerging, Specialty Pharma companies as well as some Big Pharma companies may not have the required experience and expertise in-house or have the required infrastructure to successfully develop these drug products, prove clinical success, and progress the drug (s) to a commercial launch. The pharma industry relies on the expertise and capacity of the contract development manufacturing organization (CDMO) who develops such strategies for multiple challenging products to develop these dosage forms. Trends in effective collaboration models for successful outcome with some case studies will be discussed by an expert panel of speakers.

## Schedule-at-a-Glance

| | |
|---|---|
| 12:30 – 1:30 p.m. | C&DP Luncheon* • Commonwealth |
| 1:30 – 3:00 p.m. | Scientific Sessions and Industry Roundtable |
| 3:00 – 4:15 p.m. | Exposition and Poster Sessions, Groups C & D • Hall D |
| 3:00 – 3:30 p.m. | Poster Authors Present – Group C • Hall D |
| 3:30 – 4:00 p.m. | Poster Authors Present – Group D • Hall D |
| 4:00 – 4:15 p.m. | Poster Take-Down – Groups C & D • Hall D |
| 4:15 – 7:00 p.m. | Exposition Take-Down • Hall D |
| 4:30 – 6:00 p.m. | Women in Science Networking Event* • Independence Ballroom |
| 7:00 – 9:30 p.m. | Reception: A Toast to the Town!* • Top of the Hub & Skywalk (offsite) |

## Program Highlights

### Industry Roundtable

**Enabling Successful Delivery of Life Cycle Management Strategies through Effective Collaboration**
1:30 – 3:00 p.m. • Independence Ballroom

*Sponsored by* Patheon A HEALTHIER WORLD. DELIVERED.

### Other Highlighted Events

**Women in Science Networking Event***
4:30 – 6:00 p.m. • Independence Ballroom

**Research and Life Matters: Seeking Passion and Sanity in Career**

**Paula Hammond**
Massachusetts Institute of Technology, U.S.A.

**Reception: A Toast to the Town!***
7:00 – 9:30 p.m. • Top of the Hub & Skywalk (offsite)

**Additional registration, payment, and ticket required*

# Scientific Program • Wednesday 8:30 – 10:00 a.m.



## Grand/Liberty Ballroom

### Delivery of Drug Combinations

**Moderator:** Tamara Minko
**Chair:** James Evans

**8:35 a.m. 9**
*Triolimus: Co-delivery of Paclitaxel, Rapamycin, and 17-AAG as a 3-in-1 Nanotherapeutic*
**Glen Kwon**, University of Wisconsin, U.S.A.

**9:00 a.m. 10**
*Codelivery of Dual Anticancer Drugs for Targeting Both Cancer Cells and Cancer Stem Cells*
**Yi Yan Yang**, Institute of Bioengineering and Nanotechnology, Singapore

**9:25 a.m. 43**
*Combinatorial Treatment of Idiopathic Pulmonary Fibrosis using Nanoparticles Containing Prostaglandin E and siRNA(s)*
**Olga Garbuzenko**, Rutgers University, U.S.A.

**9:33 a.m. 44**
*Combination miRNA Delivery via Bioreducible Nanoparticles Extends Survival in an* In Vivo *Model of Human Glioblastoma*
**Kristen Kozielski**, Johns Hopkins University, U.S.A.; Max Planck Institute for Intelligent Systems, Germany

**9:41 a.m. 45**
*Polymeric Nanoparticles Encapsulating Novel TLR7/8 Agonists for Enhanced Cancer Immunotherapy*
**Hyunjoon Kim**, University of Minnesota, U.S.A.

**9:49 a.m. 46**
*Spermine-modified Acetalated Dextran Nanoparticles for Cancer Chemoimmunotherapy*
**Tomás Bauleth-Ramos**, University of Porto, Portugal

## Constitution Ballroom

### Medical Devices

**Moderator:** Ron Siegel
**Chair:** Anthony Kim

**8:35 a.m. 17**
*Movements in Novel GI Device Development*
**Giovanni Traverso,** Brigham and Women's Hospital, U.S.A.

**9:00 a.m. 18**
*Implantable Pump Enabled with Battery-less, Magnetic Actuation for On-demand, Pulsatile Insulin Administration*
**Young Bin Choy**, Seoul National University College of Medicine, South Korea

**9:25 a.m. 60**
*Collagen - Copper-Doped Bioactive Glass Composite Scaffolds for the Treatment of Infection and Regeneration of Bone*
**Emily Ryan**, Royal College of Surgeons, Ireland

**9:33 a.m. 61**
*Transdermal Drug Delivery Utilizing a New Solvent Free Pressure Sensitive Adhesive (PSA): TEPI® Technology*
**Vasiliki Nikolaou**, Medherant Ltd, United Kingdom

**9:41 a.m. 62**
*Engineered Crystals for Long Term Controlled Localized Delivery of Drugs for Prevention of Immune-Mediated Fibrosis and Host Rejection of Implants*
**Shady Farah,** Massachusetts Institute of Technology, U.S.A.

**9:49 a.m.**
Moderated Discussion

## Republic Ballroom

### Overcoming Biological Barriers in Drug Delivery

**Moderator:** Claus-Michael Lehr
**Chair:** Elizabeth Nance

**8:35 a.m. 25**
*Translational Development of CriPec®* as Innovative *Nanomedicinal Platform into Clinical Stage Products with Superior Therapeutic Performance*
**Cristianne Rijcken**, Cristal Therapeutics, The Netherlands

**9:00 a.m. 26**
*A Stable Dry Powder Influenza Vaccine Formulation for Pulmonary Administration*
**Wouter Hinrichs**, University of Groningen, The Netherlands

**9:25 a.m. 75**
*Targeted, Long-Term Inhibition of Immune-Mediated Fibrosis and Host Rejection of Biomaterial Implants*
**Joshua Doloff**, Massachusetts Institute of Technology, U.S.A.

**9:33 a.m. 76**
*Systemic Nanoparticle Delivery of Nucleic Acids for Effective Cancer Therapy*
**Jinjun Shi,** Harvard Medical School, Brigham & Women's Hospital, U.S.A.

**9:41 a.m. 77**
*Protein Nanocages that Overcome Multiple Biological Barriers*
**Xinglu Huang,** Johns Hopkins University, U.S.A.

**9:49 a.m. 78**
*Overcoming the Blood-Brain Barrier through Autocatalysis for Efficient Drug Delivery to the Brain*
**Jiangbing Zhou**, Yale University, U.S.A.

# Wednesday, July 19 • Morning

## Schedule-at-a-Glance

| | |
|---|---|
| 8:00 – 11:30 a.m. | CRS Registration Open • Grand Ballroom Foyer |
| 8:30 – 10:00 a.m. | Scientific Sessions and Industry Roundtable |
| 10:15 – 11:15 a.m. | Plenary Session – Paula Hammond • Grand/Liberty Ballroom |
| 11:30 a.m. – 12:30 p.m. | CRS Board of Directors Meeting • Gardner |

## Program Highlights

### Industry Roundtable

**Challenges and Prospects of Encapsulation and Controlled Delivery in Agriculture**
8:30 – 10:00 a.m. • Independence Ballroom

*Sponsored by* Dow AgroSciences, Monsanto, Syngenta

### Plenary Session

**Nanolayers for Drug Delivery: From Cancer to Wound Healing**
10:15 – 11:15 a.m. • Grand/Liberty Ballroom

**Paula Hammond**
Massachusetts Institute of Technology, U.S.A.

**Independence Ballroom**

**Challenges and Prospects of Encapsulation and Controlled Delivery in Agriculture Industry Roundtable**

*Sponsored by*

Dow AgroSciences, Monsanto, Syngenta

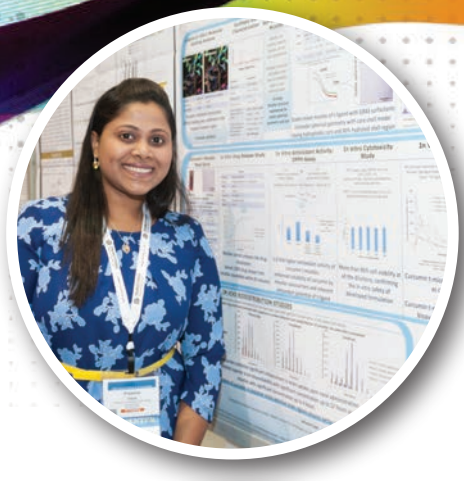
*Organized by*

**CRS Consumer & Diversified Products Division**

**Moderator:** James F. Essinger, Gowan Co.

This session focuses on encapsulation in regards to technology, trends, and opportunities in this market. The objective is to showcase different technologies and how encapsulation and controlled delivery can further enrich agricultural formulations. Topics to include: balancing herbicide activity and crop safety through microencapsulation, reinvigorating agrochemical products with microencapsulation technology, and controlled release granules for rate reduction of neonicotinoids.

**Panelists:**
**Alexander Schätz**, Syngenta Crop Protection
**William Abraham**, Monsanto
**Mei Li**, Dow AgroSciences
**Marcia Werner**, Croda Inc.



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# Connect @ the Expo

## Exposition Hall (Hynes Convention Center, Hall D)

The CRS Exposition is the place to CONNECT and discover the latest delivery science and technology trends! Meet face-to-face with leading companies from around the world—learn about new products, discuss industry challenges, and build your network.

### 2017 Exhibitors *(as of June 21, 2017)*

*Detailed description of current Exhibitors and the schedule of Exposition hours can be found in the CRS Meeting App.*

| | |
|---|---|
| 207 | Absorption Systems |
| 419 | Adhesives Research/ARx, LLC |
| 517 | Advanced Polymer Materials Inc. |
| 511 | Agilent Technologies |
| 501 | Akina, Inc.: PolySciTech Division |
| 222 | American Pharmaceutical Review |
| 514 | Anton Paar USA |
| 406 | Ashland |
| 208 | Avanti Polar Lipids, Inc. |
| 318 | BioDuro |
| 625 | Biomatrik, Inc. |
| 627 | Boston CVB |
| 320 | Capsugel* |
| 409 | Catalent Pharma Solutions* |
| 314 | Celanese |
| 413 | Corbion Purac Biomaterials |
| 405 | CordenPharma International GmbH |
| 212 | CoreRx |
| 613 | DATA Detection Technologies |
| 508 | DigiM Solution LLC |
| 615 | Dissolution Technologies |
| 316 | Dolomite Microfluidics |
| 615 | Drug Development & Delivery |
| 408 | DURECT/ LACTEL Absorbable Polymers* |
| 513 | Elsevier B.V. |
| 311 | Evonik Corporation |
| 313 | FlackTek, Inc. |
| 614 | Foster Delivery Science* |
| 403 | Freund-Vector Corp. |
| 404 | Gattefossé Corporation |
| 203 | Gaylord Chemical Company |
| 204 | IMA North America, Inc. |
| 623 | Innopharma Technology* |
| 507 | Integral BioSystems |
| 621 | IPEC–Americas |
| 505 | JenKem Technology |
| 317/319 | KORSCH America, Inc. |
| 315 | Lipoid, LLC |
| 503 | Malvern Instruments |
| 411 | Microfluidics International Corporation |
| 412/414 | MilliporeSigma* |
| 512 | NOF Corporation |
| 415 | Oakwood Labs |
| 220 | Patheon* |
| 402 | PharmaCircle |
| 619 | Phosphorex, Inc. |
| 214/216 | Pion Inc. |
| 210 | PolyMicrospheres |
| 410 | Polymun Scientific Immunbiologische Forschung GmbH* |
| 206 | Powder Systems Limited (PSL) |
| 211/213 | Precision NanoSystems Inc.* |
| 516 | ProMed Pharma |
| 401 | Shin-Etsu Chemical Co., Ltd. |
| 202 | Simulations Plus, Inc. |
| 617 | Sirius Analytical, Inc. |
| 201 | SOTAX |
| 205 | Southwest Research Institute |
| 312 | Spraybase |
| 506 | Springer |
| 509 | Surface Measurement Systems |
| 515 | Suven Life Sciences Limited |
| 407 | Teledyne Hanson Research |
| 209 | Texture Technologies |
| 222 | The Medicine Maker |
| 510 | TissueGen Inc. |
| 504 | Ursatec Verpackung GmbH |
| 518 | Wyatt Technology Corporation |

**Denotes 2017 CRS Annual Meeting & Exposition Sponsor (as of June 21, 2017)*

# 2017 CRS Awards & Recognition

## Congratulations to the 2017 Award Winners

CRS is honored to continue the tradition of recognizing the excellence of our members. Please be sure to attend the award ceremony on Sunday, July 16, and personally congratulate the awardees on their well-earned commendation. Find full biographies of awardees on the CRS website.

### Distinguished Service Award

*The Distinguished Service Award is presented to a CRS member who has exhibited exceptional commitment and service to the society and is selected by the Board of Directors.*

Nicholas Peppas
*University of Texas at Austin, U.S.A.*

### College of Fellows

*The College of Fellows recognizes those members who have made outstanding contributions to the field of delivery science and technology over a minimum of 10 years. Contributions may have been technical, scientific, and/or managerial in one or more fields of research, commercial development, education, and/or leadership within the areas of interest to CRS. Fellowship is the most prestigious level of membership in CRS.*

Hongming Chen
*Kala Pharmaceuticals, Inc., U.S.A.*

Sevda Şenel
*Hacettepe University, Turkey*

Patrick Sinko
*Rutgers University, U.S.A.*

Kathryn Uhrich
*Rutgers University, U.S.A.*

Ernst Wagner
*Ludwig Maximilians University, Germany*

### Founders Award

*The society grants this honor to a current CRS member who is internationally recognized for outstanding contributions in the science and technology of controlled release.*

Mark Saltzman
*Yale University, U.S.A.*

### CRS T. Nagai Postdoctoral Research Achievement Award

*Cosponsored by The Nagai Foundation Tokyo*

*This award recognizes an individual postdoc who has recently completed postdoctoral research in controlled release science and technology and the postdoc's advisor, who played an integral role in the achievements.*

Maike Windbergs
*Helmholtz-Institute for Pharmaceutical Research Saarland, Germany*

Claus-Michael Lehr
*Helmholtz-Institute for Pharmaceutical Research Saarland, Germany*

### Young Investigator Award

*This award recognizes a CRS member who has made outstanding contributions in the science of controlled release and is 40 years of age or younger in the year the award is presented.*

Zhen Gu
*University of North Carolina, U.S.A.*

## *Drug Delivery and Translational Research* Outstanding Paper Award

*Cosponsored by Springer*

*This award recognizes outstanding research in the field of drug delivery and translational research that was published during 2016 in* Drug Delivery and Translational Research.

Nathaniel Hwang
*Seoul National University, South Korea*

Co-authors: Jiseung Heo, Rachel Koh, Whuisu Shim, Hwan Kim, Hyun-Gu Kim.

*Riboflavin-induced photo-crosslinking of collagen hydrogel and its application in meniscus tissue engineering.* Drug Delivery and Translational Research: *Volume 6, Issue 2, pages 148–158 (2016)*

## Jorge Heller *Journal of Controlled Release* Outstanding Paper Award

*Cosponsored by Elsevier*

*This award recognizes an outstanding regular paper related to the science of controlled release (not an invited, review, or special meeting paper) that was published during 2016 in the* Journal of Controlled Release.

Jaya Arya
*Georgia Institute of Technology, U.S.A.*

Co-authors: Kristopher Dewitt, Maya Scott Garrard, Yu-Wei Chiang, Mark Prausnitz

*Rabies vaccination in dogs using a dissolving microneedle patch.* Journal of Controlled Release: *Volume 239, pages 19-26 (2016)*

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## Thank You Sponsors

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**Sponsors as of June 19, 2017. Please see Program Addendum for additional sponsors.*

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