

INTERNATIONAL CENTRE FOR DIFFRACTION DATA

# EDUCATIONAL EVENTS 2012

[WWW.ICDD.COM/EDUCATION](http://WWW.ICDD.COM/EDUCATION) • [INFO@ICDD.COM](mailto:INFO@ICDD.COM)



**Through worldwide symposia, workshops, training courses and the industry's leading conference, the Denver X-ray Conference, we hold true to our mission to promote the application of materials characterization methods and to provide a forum for the exchange of new ideas and cutting-edge knowledge in this field.**

For over 70 years, the International Centre for Diffraction Data has been providing the utmost quality powder diffraction data to scientists. As a not-for-profit corporation, we are dedicated to collecting, editing and publishing the world famous Powder Diffraction File (PDF).

**Employees of some of the nation's most prominent businesses, corporations, government agencies and academic institutions participate in the ICDD's clinics and workshops:**

Bristol-Myers Squibb	Pratt & Whitney Corporation
Bruker AXS, Inc.	Rigaku Americas Corporation
Corning Incorporated	Royal Canadian Mounted Police
Dow Chemical Company	Sandia National Laboratories
Eastman Kodak Company	Savannah River National Laboratory
Eli Lilly and Company	SPEX SamplePrep LLC
FBI	SÜD-CHEMIE INC.
General Electric	Thermo ARL
IBM Microelectronics	University of Botswana
Kaiser Aluminum	University of California – Davis
Oxford Instruments	U.S. Army Research Laboratory
PANalytical	U.S. Customs & Border Protection/ Department of Homeland Security
Pennsylvania State University	

### *Why Choose the ICDD Training Courses?*

The purpose of the ICDD training courses is to teach both theoretical knowledge and practical applications of either X-ray fluorescence spectrometry or X-ray powder diffractometry. Instructors have extensive experience in the field and are specially selected from both academia and industry to produce the best of theory and practice. The focus on practical applications, hands-on experience, and intense personal instruction differentiates ICDD courses from other venues. Each course utilizes a team of instructors representing a range of expertise to meet your training needs.

ICDD, the ICDD logo and PDF are registered in the U.S. Patent and Trademark Office. Powder Diffraction File is a trademark of JCPDS—International Centre for Diffraction Data.

## TABLE OF CONTENTS

### XRF TRAINING

- 2 Practical X-ray Fluorescence Clinic
- 3 Handheld XRF Workshop

### XRD TRAINING

- 4 Fundamentals of X-ray Powder Diffraction Clinic
- 4 Advanced Methods in X-ray Powder Diffraction Clinic
- 6 Rietveld Refinement & Indexing Workshop
- 8 General Information
- 8 Tuition Waivers



## Practical X-ray Fluorescence Clinic

30 APRIL – 4 MAY

Registration fee: \$1,830

### LECTURES

Fundamentals of X-ray physics / WDX and EDX spectrometry instrumentation / Qualitative, semi-quantitative and standardless analysis / Introduction to quantitative analysis / Types and sources of error / Precision and accuracy / Calibration strategy / Drift, line and interelement correction application / Fundamental parameters / Maintaining instrument integrity / Specimen preparation

**A unique balance of WDX and EDX topics**  
**Cutting-edge Equipment Demonstrations • TXRF**  
**Handheld XRF • Fusions WDX & EDX Bench-top & Floor Units**

### WORKSHOPS

XRF instrumentation, components, scope, and comparison using live and disabled WDX and EDX instrumentation

Selection of parameters for operation

Hands-on personal computer exercises in qualitative, semi-quantitative and standardless WDX and EDX analysis

Hands-on personal computer exercises employing polynomial regression, line overlap, empirical and fundamental parameter corrections during calibration

Specimen preparation lecture and demonstration of the use of mixers, grinders, presses, fusion apparatus, etc.

Discussion of problems encountered by participants

#### Submit YOUR SAMPLES for analysis by the XRF experts.

Selected results will be the basis for class discussion. Results not presented during class can be discussed, in private, with the faculty throughout the week. Please mark the box on the clinic registration form for more information on how to participate in this sample measurement exercise. NOTE: All samples must be submitted 4 weeks prior to start of course.

### X-RAY FLUORESCENCE FACULTY

**John A. Anzelmo**

*Anzelmo & Associates, Inc., Madison, WI*

**Larry Arias**

*Bruker AXS, Inc., Madison, WI*

**Richard C. Bostwick**

*SPEX SamplePrep LLC, Metuchen, NJ*

**Larry E. Creasy**

*Morgantown, PA*

**Mary Ann Zaitz**

*IBM Microelectronics, Hopewell Junction, NY*

Note: Faculty may change without prior notice to attendees.

## Handheld XRF Workshop

16 – 18 OCTOBER

Registration fee: \$899

The combination of portability, nondestructive on-site analysis, and relatively low cost has led to explosive growth in the use of handheld X-ray fluorescence spectrometers. Offering a wide array of capabilities, units are now being manufactured by dozens of different companies. Each unit combines state-of-the-art technology in miniaturized X-ray sources, advanced focusing optics and integrated Pocket PC technology for digital signal processing, telecommunications, and solid state reliability. Accessories such as GPS, wireless transmission, and integrated data analyses are being added to this platform, rapidly expanding the technology and its applications.

This 3-day workshop is designed for current users who are seeking best methods and optimized results. It is also designed to provide basic theory and applications for those interested in understanding the best instrumentation and accessories for a particular application.

### LECTURES

X-ray physics excitation & properties of X-ray spectra / Precision and accuracy, Counting statistics, Limit of detection / Surface effects, Penetration depth, Sampling effects, Mineralogical effects / Energy Dispersive Spectrometry / Overview of components / Selection of parameters for operation / Radiation safety / Compton scatter, FP methods, Calibrations / Comparison to certified values and ICP results

### WORKSHOPS

General metals analysis—including precious metals and light elements in heavy matrices

Consumer/RoHS Products analysis—including surface / coatings considerations

Geochem/mining analysis—including light elements in complex matrices

Field Environmental—heavy metals in light matrices—soil, liquids and dust wipes

Cultural Heritage—including paints, coatings, and surface considerations for unique objects

### LABORATORY HANDS-ON

Specimen considerations and influence on results / Data acquisition / Specimen surface / Irradiation depth / Tricks of the trade

### HANDHELD FOR XRF FACULTY

**John A. Anzelmo**

*Anzelmo & Associates, Inc., Madison, WI*

**Marty Mastovich**

*Thermo Scientific Niton XRF Analyzers*

**John Patterson**

*Bruker Elemental, Hamilton Square, NJ*

**Kim Russell**

*Olympus Innov-X, Woburn, MA*

**Mary Ann Zaitz**

*IBM Microelectronics, Hopewell Junction, NY*

Note: Faculty may change without prior notice to attendees.

# Fundamentals of X-ray Powder Diffraction Clinic—XRD I

4–8 JUNE

Registration fee: \$1,830

Production and properties of X-radiation: continuous and characteristic radiation, absorption, scatter and diffraction

Production of monochromatic X-radiation: choice of source conditions, use of  $\beta$ -filters, proportional detectors and pulse height selection, monochromators, use of solid-state and area detectors

Components of the diffraction pattern: reflection, positions and intensities, Miller indices, effects of scatter and fluorescence

Acquisition of good diffraction data: specimen preparation techniques and measurement of powder patterns using diffractometer methods

The powder diffractometer: optical arrangement, factors affecting instrumental profile width, choice and function of divergence slit, calibration and alignment, detectors, X-ray optics

Qualitative phase identification: the Powder Diffraction File (PDF), quality of reference patterns, the Alphabetical Index, the Hanawalt Index, the Fink Index, and specialized subfiles

Hands-on use of personal computers for demonstration of the latest software

Data mining with the PDF

# Advanced Methods in X-ray Powder Diffraction Clinic—XRD II

11–15 JUNE

Registration fee: \$1,830 or both XRD I & II for \$3300

Brief review of fundamentals

Factors affecting d-spacings of crystals: unit cell, crystal structure, and solid solutions

Factors affecting accuracy of measured  $2\theta$  values: intensity aberrations, specimen displacement, specimen transparency, diffractometer misalignment, and the use of external and internal standards

Factors affecting diffraction-line intensities: relative and absolute intensities; structure-sensitive properties (atomic scattering and structure factors), polarization effects, and multiplicity; specimen-sensitive effects (orientation, particle size), measurement-sensitive effects, and choice of scanning conditions

Use of the Powder Diffraction File (PDF) for qualitative phase analysis—alphabetical searching, Boolean search methods, use of data other than d/I values

Hands-on use of computer methods for qualitative phase identification: peak-hunting methods, data reduction/treatment methods, search/match techniques, use of elemental data, error windows and probability searching, and scoring algorithms

Quantitative analysis: use of Reference Intensity Ratios, binary mixtures, absorption correction methods, and matrix-flushing methods

Exploration of powder indexing methods

Data mining with the PDF

Lecture and workshop surrounding the Rietveld method for quantitative analysis

## X-RAY POWDER DIFFRACTION FACULTY

**Thomas N. Blanton**

*Eastman Kodak Company, Rochester, NY*

**Cyrus Crowder**

*International Centre for Diffraction Data, Newtown Square, PA*

**Timothy Fawcett**

*International Centre for Diffraction Data, Newtown Square, PA*

**Catharine Foris**

*ForChem Consultants, Wilmington, DE*

**Stacy Gates**

*International Centre for Diffraction Data, Newtown Square, PA*

**Suri Kabekkodu**

*International Centre for Diffraction Data, Newtown Square, PA*

**James Kaduk**

*Poly Crystallography Inc., Naperville, IL*

**W. Frank McClune**

*International Centre for Diffraction Data, Newtown Square, PA*

**Fangling Needham**

*International Centre for Diffraction Data, Newtown Square, PA*

**Susan L. Quick**

*The Pennsylvania State University, University Park, PA*

**Mark Rodriguez**

*Sandia National Laboratories, Albuquerque, NM*

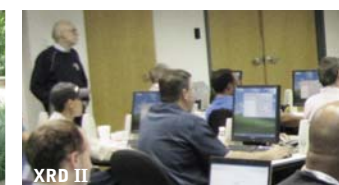
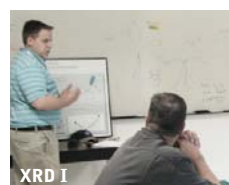
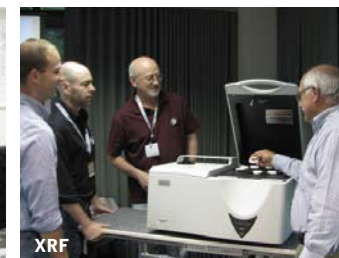
**Earle R. Ryba**

*The Pennsylvania State University, University Park, PA*

**Charles Weth**

*International Centre for Diffraction Data, Newtown Square, PA*

Note: Faculty may change without prior notice to attendees.



## Rietveld Refinement & Indexing Workshop

**BASIC WORKSHOP: 1–3 OCTOBER**

**ADVANCED WORKSHOP: 4–5 OCTOBER**

*Registration fee: \$1,830 (Basic \$1,100 / Advanced \$730)*

Take the three-day basic workshop, the two-day advanced workshop or attend both for a full week of hands-on training.

**The Rietveld Refinement & Indexing workshop is an intense workshop; please review the following prerequisites:**

1. Participants must have 1 or 2 years of practical lab experience or have taken ICDD's XRD I Clinic, and have a basic understanding of crystallography.
2. In order to attend the advanced workshop, participants must take, or have taken in the past, ICDD's Basic Rietveld workshop.

Learn the principles and techniques of Rietveld analysis at ICDD's specialized workshops. Reinforce your learning experiences with our hands-on data analysis training!

### DISCOVER THE RIETVELD METHOD AS A POWERFUL TOOL FOR:

- Extracting accurate and precise structural information from powder patterns of inorganic, organic, coordination compounds, and metal & alloy compounds
- Performing accurate quantitative phase analysis
- Obtaining microstructural information such as size, strain, and texture

As a result of our collaboration with the Material Phases Data System, the incorporation of the Linus Pauling File has supplied atomic coordinates and related parameters to ICDD's new PDF-4+ database. This workshop will focus on the expanded quantitative and structural analysis capabilities of PDF-4+.



*Let the experts guide and advise you through the problem solving techniques to maximize the quality of your results!*



### RIETVELD REFINEMENT & INDEXING WORKSHOP FACULTY

#### **Cyrus Crowder**

*International Centre for Diffraction Data, Newtown Square, PA*

#### **John Faber**

*Emeritus, ICDD, Newtown Square, PA*

#### **Stacy Gates**

*International Centre for Diffraction Data, Newtown Square, PA*

#### **Amy Gindhart**

*International Centre for Diffraction Data, Newtown Square, PA*

#### **Suri Kabekkodu**

*International Centre for Diffraction Data, Newtown Square, PA*

#### **James A. Kaduk**

*Poly Crystallography Inc., Naperville, IL*

#### **Fangling Needham**

*International Centre for Diffraction Data, Newtown Square, PA*

*Note: Faculty may change without prior notice to attendees.*

## Lodging

A block of rooms is reserved for clinic participants at the Best Western Concordville Hotel, Routes 322 & 1, Concordville, PA 19331, Tel: +610.358.9400, Fax: +610.358.9381, Web site: [www.concordvilleinn.com](http://www.concordvilleinn.com). The special ICDD rate of \$119.00 plus 9% tax includes a complimentary daily breakfast buffet in the hotel dining room and complimentary daily round-trip transportation to the ICDD. Please note, you will be responsible for your own transportation to and from ICDD if you book outside of the ICDD room block. The deadline for reservations is three weeks prior to the start of each clinic session. You will not be guaranteed a room after that time. Please visit our website [www.icdd.com/education/hotel.htm](http://www.icdd.com/education/hotel.htm) for all lodging information.

## Transportation

Information on airport shuttles, driving directions and maps can be obtained by visiting our web site at [www.icdd.com/education](http://www.icdd.com/education). The Best Western Concordville Inn Hotel will provide daily round-trip transportation between the hotel and ICDD for all attendees in our room block.

## Fee and Registration

Registration fees for training courses include textbooks, lecture, workshop and lab materials as well as catered lunches Monday through Thursday. To guarantee a place in class, registrations must be received no later than six weeks prior to the start of the course. If the registration deadline date has past, please call to inquire about available spots. **Please note:** A minimum of ten registrants per course is required, otherwise the course will be cancelled and you will be refunded your registration fee. You will be notified of a course cancellation no later than two weeks prior to the start of the course.

## Tuition Waivers\*

ICDD offers a limited number of tuition waivers for the XRF, XRD I, XRD II clinics, and the Rietveld workshop. The tuition waivers were established to promote the education of the scientific community, particularly the academic sector, in X-ray materials analysis. Faculty members and graduate students are encouraged to apply. If you are currently developing a program in X-ray fluorescence spectrometry (XRF), X-ray powder diffraction (XRD) or Rietveld analysis, or are interested in incorporating these topics into an established course, a tuition waiver can provide you with the opportunity to learn the principles and practices of these disciplines from experts in the field. Please note that the tuition waivers cover the tuition only; travel and lodging are the responsibility of the attendee. To apply for a tuition waiver, please submit a one-page written request stating your objectives in attending the course, and/or how you will incorporate these disciplines into your curriculum, to the address listed on the Registration Form. **Tuition waiver requests must be accompanied by a registration form and received at ICDD by the deadline for registration.** All applications will be reviewed on a competitive basis, and recipients will be notified no later than four weeks prior to the start of the session.

\* Named in honor of world-reknown scientists, Eugene P. Bertin, Ron Jenkins, and Deane K. Smith. Tuition Waivers are not applicable to the Handheld XRF workshop.

## Location

**ICDD Headquarters**  
**12 Campus Boulevard**  
**Newtown Square, Pennsylvania, 19073-3273 U.S.A.**  
**Phone: + 610.325.9814**

## On-site Training Solutions

Contact ICDD to find out how you can host customized X-ray analysis training at your location. With on-site training, you'll have the advantage of dedicated attention by our faculty members, addressing the specific needs of your staff—all while working hands-on with your lab instrument.

Contact: **Eileen Jennings, Education Coordinator**  
 E-mail: [clinics@icdd.com](mailto:clinics@icdd.com) or Telephone: **+610.325.9814**

## Working with pharmaceuticals?

# PPXRD-11

Pharmaceutical Powder X-ray Diffraction Symposium

**15–18 May • Sanibel Harbour Marriott Resort & Spa,  
 Fort Myers, Florida, U.S.A.**

Visit [www.icdd.com/ppxrd](http://www.icdd.com/ppxrd) or e-mail: [ppxrd@icdd.com](mailto:ppxrd@icdd.com)

This annual symposium is designed to create a forum for the exchange of knowledge and cutting-edge ideas among those interested in the combined fields of XRD and pharmaceutical sciences. PPXRD will also include a workshop on "Understanding Amorphous Pharmaceutical Materials."



*61<sup>st</sup> Annual Conference on  
 Applications of X-ray Analysis*

**DENVER X-RAY CONFERENCE**

**6–10 AUGUST**

**DENVER MARRIOTT TECH CENTER HOTEL,  
 DENVER, COLORADO, U.S.A.**

Don't miss this opportunity to network with leaders in the field of X-ray materials analysis & choose from many specialized workshops to advance your expertise!  
*Interested?* Find out more at [www.dxcicdd.com](http://www.dxcicdd.com)