

Chair's Message

Thanks to all who helped make our meeting in San Diego a great success. I trust you are all enjoying the diversity in our programming; we are continuing to offer symposia that address new and exciting topics. If you have additional ideas, please do not hesitate to contact me or our Program Chairs Mitch Katz or Bill Johnson.

In an attempt to have continuing Division activities between National Meetings we have instituted a monthly Executive Committee conference call. These conference calls are currently scheduled for the second Tuesday of every month. Although we have only had a few since San Diego, they seem to be working well. Please let me know, either directly or by e-mail (chauff@swlaw.com) if you wish to participate. As with all of our face-to-face meetings at the National meetings, these calls are open to all who wish to participate.

It was my distinct honor and privilege to present to Shirley Radding and

Jack Riley Lifetime Achievement Awards while in San Diego. CHAL has such a rich history of involvement from our founding members, and I know we all appreciate how much Shirley and Jack have done (and continue to do) for CHAL. Nevertheless, I continue to encourage all of our members to get involved. Do something this year that you have not tried in the past. Chances are very good that you will enjoy your involvement and the Division will surely benefit.

I also continue to encourage each and every one of you to make it a personal goal to invite at least one new member to join the division. Over the last several years I have watched new members really enjoy their participation. CHAL offers its members a unique opportunity to advance civic, scientific and legal objectives. As I requested in my first Chair's message, please make it your goal to invite just ONE new member to join our ranks.

CHAL EVENTS AT CHICAGO

Social Hour

All welcome.

5:00 p.m.

Sunday, August 26, 2001
Northwestern School of Law,
Lowden Hall
in the Levy Mayer Building
(Directions on the next page)

Executive Board Meeting

All welcome.

6:00 p.m. - 9:00 p.m.

Sunday, August 26, 2001
(after the social hour, same place.)

Presentation of Papers

Sunday to Tuesday

August 26 to 28, 2001

McCormick Place, North

Notice of Open Meeting

Monday, August 27, 2001

(after the morning session)

NEWSLETTER INDEX – PAGE 28

I look forward to seeing all of you in Chicago as we enjoy another great series of programs. Please do not hesitate to contact me or any other member of the Executive Board with questions, comments or suggestions.

Charles F. Hauff, Jr.

This newsletter will also
be available on
<http://membership.acs.org/c/chal/>

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Primary version is as print on paper, mailed twice-yearly from Palo Alto, California, prior to ACS national meetings, and distributed at those meetings; also on <http://membership.acs.org/C/CHAL/>. Opinions expressed are those of the authors & not necessarily of CHAL or ACS. While great effort is made for accuracy, factual errors are possible; CHAL and ACS bear no liability for such errors, and CHAL invites correction for future publication. References, including Internet sites, cited as bibliography or for general interest, are intended for readers' convenience only, and are not endorsed as to opinions or for detailed accuracy or timeliness, which are the responsibilities of the authors and publishers of those references. Internet site citations were thought to be timely within a few weeks before this newsletter went to press; however, some may have become stale. Mention of publications, products, or services is intended for readers' convenience only and not as commercial endorsement. Discussion of legal issues is for information purposes & is not legal advice; legal advice should be sought from licensed lawyers formally consulted for that purpose. Readers' comments are welcome and future articles from them are invited – especially to broaden the range of topics and viewpoints – address to: M. Grossman, editor, or to item author, or to CHAL. Newsletter designed by MontiGraphics, Mountain View, CA 94043. Phone: (650) 691-0900, Fax: (650) 691-0902, e-mail: montigrp@best.com.

Program Chair's Report

Upcoming National Meeting 222nd ACS National Meeting Chicago, August 2001

Following the successful programs we had at the San Diego meeting, we will be presenting the following programs at the upcoming Chicago meeting.

On Sunday, an all-day symposium will look at recent developments in the field of forensic science research. This symposium is being organized and presided over by Carl Meyer of the Law Offices of Carl Meyer, and Stephen Homeyer of the Forensic Science Research Unit at the FBI Laboratories. The symposium will cover a variety of recent developments in forensic science research, both at the FBI and the Illinois State Police.

Morning topics will include developments in instrumentation in field forensic analysis, Mitochondrial DNA typing, CE analysis of forensic samples for poisonous anions, elemental profiling of evidentiary materials, DNA analysis, the evolution of quality assurance practices in DNA analysis, the analysis of paint by pyrolysis/gas chromatography/mass spectrometry, and the identification of primer gunshot residue by scanning electron microscopy. Afternoon topics include the role of chemistry in litigation and the role of the expert in presenting forensic evidence. The afternoon session also includes a panel discussion and a presentation regarding science and Capital Hill from the current ACS Science Policy Fellow, Catherine Woytowicz.

Monday morning finds a half-day symposium regarding emerging issues in food law. This symposium is being organized and presided over by Gavin Thompson of Environ International Corp. Speakers will cover a wide spectrum of topics in the area of food

packaging technology and the new food contact notification program. Presentations will include the new regulations on food contact notifications (FCN), the FDA perspective on the FCN program, the emergence of active and intelligent packaging, analytical methodologies employed in the FDA food contact compliance investigation and the issues surrounding irradiated polymer submissions to the FDA.

Then, on Monday afternoon, the first of two half-day symposia in the field of intellectual property will take place. This symposium, which is being organized and presided over by Herbert Hart of McAndrews, Held & Malloy, Ltd, will include the topics of protecting your invention, inventorship determinations, a primer on the important field of patent interferences and an update on recent case law developments in the intellectual property field.

On Monday evening, Howard Peters of Peters, Verny, Jones & Biksa, LLP will organize and present a number of posters at Sci-Mix. A variety of very interesting topics run the gambit from inventions of famous people to the history of chocolate and the patent for Monopoly, the board game. Other posters look at the everyday inventions of African Americans and the 2001 inductees to the National Inventors Hall of Fame.

Finally, on Tuesday morning, the second half-day intellectual property symposium will look at "Hot topics and Emerging issues" in the field. Speakers will be covering a variety of areas including the Hatch-Waxman Act, the ability to obtain broad claims in an "ever-shrinking universe," pre-grant publication and revised guidelines for utility and written description as well as practical tips for dealing

with recent changes in the law.

We will have a social hour following the symposium on Sunday, August 26, 2001, starting at 5:00 p.m. at Northwestern School of Law (see below). We will have our executive board meeting from 6:00 to 8:00 p.m. on Sunday evening following the social hour. Everyone is invited to both the social hour and executive board meeting.

Please contact me or my co-chair, Mitch A. Katz, also at Needle & Rosenberg, P.C., if you have any interest in chairing a symposium at any future Chemistry and the Law Division program. The upcoming future national meetings are as follows:

FUTURE NATIONAL MEETINGS

**223rd ACS National Meeting
Orlando, Florida, April, 2002**



**224th ACS National Meeting
Boston, September 2002**



**225th ACS National Meeting
New Orleans, March 2003**



**226th ACS National Meeting
New York City, September 2003**

William R. Johnson.

• Directions •

Northwestern School of Law
357 East Chicago Avenue
Chicago, IL 60611

5 blocks north of Holiday Inn Chicago City Centre, 300 East Ohio Street – go northward to cross East Ontario, Erie, Huron and Superior Streets. Holiday Inn Chicago City Centre is on the ACS shuttle bus service route that operates Sunday until 10:30 pm.

Shirley Radding and Jack Riley Receive CHAL Awards



Over 20 years ago the ACS Division of Chemistry and the Law (CHAL) was born in the Santa Clara Valley local section. For several years it was a subdivision and a probationary division before it received full status in 1985. Santa Clara Valley Local Section members have been critical to the establishment and growth of the Division.

At the San Diego ACS meeting the Division presented Lifetime Achievement Awards (as engraved mantle clocks) to charter members Shirley Radding and John (Jack) Riley to recognize their long term and continued support of the Division.



Shirley Radding receives Division on Chemistry and The Law Lifetime Achievement Award at ACS San Diego Meeting from CHAL Chair Charles Hauff

Shirley is now retired from SRI International in Menlo Park and is well known to CHAL members. She served as Chair of CHAL and on its Executive Committee as its newsletter editor for years and has received the Division's Middlekauf Service Award.

Jack is now retired from Lockheed in Palo Alto and is also well known to CHAL members. He served as Chair of CHAL and on the Executive Committee as its membership chair for years and has received the Division's Middlekauf Service Award.

Our congratulations to Shirley and Jack for this well deserved recognition.



Jack Riley receives Division on Chemistry and The Law Lifetime Achievement Award at ACS San Diego Meeting from CHAL Chair Charles Hauff



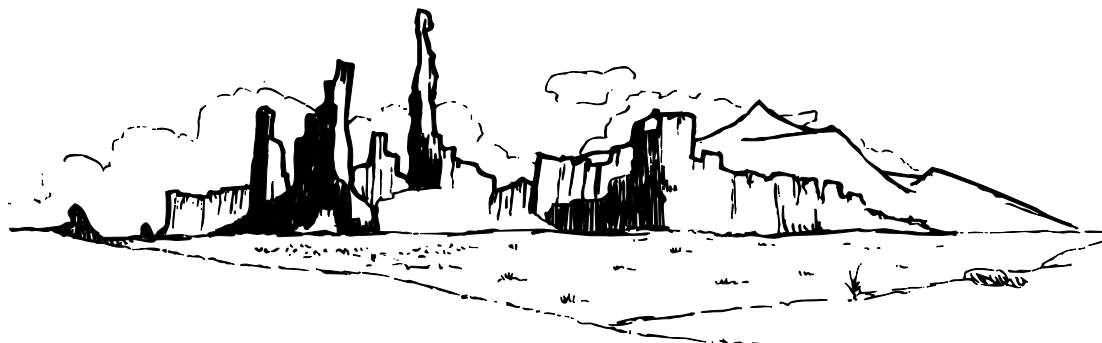
From the Editor

I would like to thank everyone who helped on this my second issue of this newsletter as the new editor. I still have some editorial learning to do, most particularly for persuading members to write analysis and news articles. This issue contains a contributed CHAL news item (awards to Shirley Radding and Jack Riley) for which I thank Howard Peters.

But I received no analysis articles. So please think about writing an analysis or news item, and try to persuade others.

When you do decide to contribute, please contact me as soon as possible as to publishing deadlines. Unfortunately, recent newsletter issues have arrived by mail to some members not-in-time for the ACS national meetings for which they were published. This is a serious problem; I am working on it.

Michael Grossman



Program for Chicago Meeting

Division of Chemistry and The Law

August 26-30, 2001

Kate Boyer, Program Secretary William Johnson, Program Chair

SUNDAY MORNING

McCormick Place, North

Forensics – Forensic Science Research at the FBI

C. Meyer, Organizer, S. T. Homeyer, Organizer, Presiding

1. 8:00 Forensic Science Research at the FBI.
S. T. Homeyer
2. 8:30 Developments in instrumentation for field forensics analysis.
B. A. Eckenrode, V. J. Schannen
3. 9:00 Mitochondrial DNA Typing For Forensic Analysis.
K. A. Dugan, H. S. Lawrence, C.L. Fisher
4. 9:30 The CE analysis of forensic samples for poisonous anions.
M. L. Miller, J. Doyle, R. Gillette
5. 10:00 Elemental profiling of evidentiary materials.
J. Buscaglia, R. D. Koons
6. 10:30 DNA analysis: A tool for resolving violent crime.
T. R. Moretti, B. W. Koons
7. 11:00 The evolution of quality assurance practices in forensics DNA analysis.
R. A. Guerrieri
8. 11:30 Forensic analysis of paint by Pyrolysis-Gas Chromatography-Mass Spectrometry.
J. F. Cerven
9. 12:00 Identification of primer gunshot residues by Scanning Electron Microscopy.
M. A. Kopina

SUNDAY AFTERNOON

McCormick Place, North

Forensics – Litigation, Expert Testimony and Panel Discussion

S. T. Homeyer, Organizer, C. Meyer, Organizer, Presiding

10. 1:30 The role of chemistry in litigation.
C. Meyer

11. 2:00 The role of the expert, and how to effectively present forensic evidence.
C. Meyer
- 2:30 Panel Discussion.
12. 4:00 Science and the law on the Hill: The Science Policy Fellowship.
C. Woytowicz

MONDAY MORNING

McCormick Place, North

Emerging Issues in Food Law – Packaging Technology and the New Food Contact Notification Program

G. P. Thompson, Organizer, Presiding

13. 9:00 The new regulations on Food-Contact Notifications (FCN).
E. F. Greenberg
14. 9:30 An FDA perspective on the Food Contact Notification program.
M. A. Adams
15. 10:00 Active and intelligent packaging is here; Can current regulations be used.
P. N. Gray
16. 10:30 Food Contact Materials (FCM) experience: Problems and approaches.
G. P. Thompson
17. 11:00 Analytical methodologies employed in FDA food contact compliance investigation.
J. S. Eberhard
18. 11:30 Irradiated polymer submissions to the FDA: Unique problems and approaches.
G.D. Sadler, E. Miller

MONDAY AFTERNOON

McCormick Place, North

Intellectual Property – A Primer and Update on the Law

H. D. Hart III, Organizer, Presiding

19. 1:00 Protecting your innovations.
R. W. Fieseler

20. 1:35 Avoiding pitfalls in inventorship determinations.
E. W. Remus
21. 2:10 A primer on patent interferences.
H. D. Hart III
22. 2:45 Recent case law developments.
G. F. Wheeler
- 3:20 Question and Answer Session.

MONDAY EVENING

Hyatt Regency Chicago

Sci-Mix

H. M. Peters, Organizer, Presiding

23. Everyday inventions of African-Americans.
H. M. Peters, S. Peters
24. MONOPOLY: The board game-U.S. Patent 2,026,082.
H. M. Peters, S. Peters
25. Surprising patents and inventions of famous people.
H. M. Peters, S. Peters
26. You don't need to be a rocket scientist to be an inventor.
H. M. Peters, S. Peters
27. 2001 Inductees to the National Inventors Hall Of Fame.
H. M. Peters
28. Death by chocolate: A brief history of chocolate.
H. M. Peters, S. Peters
29. Dr. George Washington Carver, Peanut Products and Patents.
H. M. Peters, T. M. Peters
30. Dr. Percy L. Julian - Preparation of Cortisone, U.S. Patent 2,752,339
S. Peters
31. Milton S. Hershey - One of a kind, founder of the Hershey Chocolate Company.
H. M. Peters, S. B. Radding
32. Norbert Rilleux - Sugar Chemist.
H. M. Peters, S. B. Radding

TUESDAY MORNING*McCormick Place, North***Intellectual Property – Hot Topics and Emerging Issues***W. R. Johnson, Organizer, Presiding*

33. 9:00 Drug Wars: Waxing philosophic over Hatch-Waxman.
C. R. Krikorian
34. 9:30 Broad Claims in an Ever-Shrinking Universe.
S. L. Nebolsky
35. 10:00 Pre-grant publication of patent applications in the U.S.
B. C. Meadows
36. 10:30 The revised guidelines for utility and written description and what they mean for the inventor in the chemical or biological sciences. *D. E. Huizenga*
37. 11:00 Practical Tips on Dealing with Recent Changes in the Law.
W. R. Johnson
- 11:30 Question and Answer Session re Changes in the Law.

TUESDAY MORNING*McCormick Place, North***Diversity: A Requirement for Success I – Cosponsored with Committee on Chemists with Disabilities, and Division of Professional Relations.****TUESDAY AFTERNOON***McCormick Place, North***Diversity: A Requirement for Success II – Cosponsored with Chinese American Chemical Society, and Division of Professional Relations.****Treasurer's Report**

January 1 – June 1, 2001

| | |
|--|--------------------|
| Starting Balance | \$ 6,191.78 |
| Income | |
| ACS Division Dues (July-December, 2000) | \$ 6,830.00 |
| Royalty, CRC Press Inc. (January-June, 2000) | 303.72 |
| FoxKiser Donation to Education Fund | 2,500.00 |
| New Member Dues | 50.00 |
| Total | \$15,875.50 |
| Expenses | |
| Spring Newsletter (includes Bulk Mail Fee and Deposit) | \$ 5,723.24 |
| Incorporation | 195.00 |
| Speaker Registration Fees for Fall Meeting | 1,025.00 |
| LCD Projector Fees for Fall Meeting | 4,450.88 |
| Awards | 200.00 |
| Reimbursement for 2000 Office Expenses (AOR) | 31.94 |
| Councilor Reimbursement | 2,672.43 |
| Division Officer Caucus 2001 Dues | 60.00 |
| Bank Charges (December, 2000 to April 2001) | 26.60 |
| Total | \$14,385.09 |
| Ending Balance | \$ 1,490.41 |

Books in Brief

In Drawing the Line/How Mason and Dixon Surveyed the Most Famous Border in America, Edwin Danson, a surveyor, writes about the 18th century scientific advances that allowed this difficult survey to be accomplished on the ground, and why it was important a century before the Civil War gave the line much of its modern fame. The author reviews the aspects of British and colonial American history, and British government financed scientific research for naval purposes, that caused Lord Baltimore and Thomas Penn to arrange for Charles Mason and Jeremiah Dixon to survey the boundary between their colonies of Maryland and Pennsylvania. This was important science/law interface – astronomical science was applied

to finally settle a legal boundary dispute that involved such practicalities as to which colony a resident should pay his taxes.

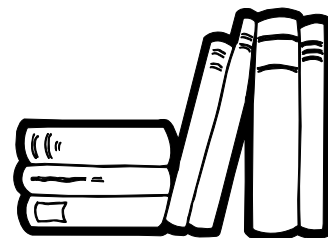
Edwin Danson

Drawing the Line/How Mason and Dixon Surveyed the Most Famous Border in America

John Wiley and Sons, Inc.
New York, 2001

ISBN 0-471-38502-6

\$24.95



222nd ACS National Meeting Chicago August 26-30, 2001

Abstracts for Chemistry and The Law Papers

CHAL 1 [482998]

Forensic Science Research at the FBI.

Stephen T. Homeyer, Forensic Science Research Unit, FBI Laboratory, FBI Academy, Building 12, FSRU, Quantico, VA 22135, Fax: 202-632-4557, Shomeyer@FBIAcademy.edu

The rapidly evolving technological challenges associated with terrorist and violent crime incidents have elevated R&D as a major priority within the FBI Laboratory. The Forensic Science Research Unit (FSRU), through collaborative R&D with the national laboratories and academia, has made significant advancements in the development of new techniques and protocols in material, chemical, and biological forensic analyses. Highlights of our recent accomplishments and new research activities will be summarized, including our R&D efforts in the areas of toxicology, trace evidence evaluation, energetic materials, nuclear and mitochondrial DNA, database development, elemental analysis, latent print examinations, field portable instruments, and crime scene response.

CHAL 2 [483017]

Developments in instrumentation for field forensics analysis.

Brian A. Eckenrode, and Valerie J. Schannen, Forensic Science Research Unit, FBI Laboratory, FBI Academy, Quantico, VA 22135, Fax: 703-632-4557, baackenrode@fbiacademy.edu

The identification of chemical threats at a scene or on-site in real-time is a major challenge due to the nature of the chemicals involved as well as the lack of adequate field-ready instrumentations that is currently available. The diverse detection scenarios require a light level of instrumentation diversity that is realized with new developments in portable gas chromatography (GC), portable Raman spectroscopy, portable GC coupled with mass spectrometry (MS). Much progress has been made in the development and evaluation of fieldable rapid analysis methodology utilizing a state-of-the-art miniature low thermal mass GC for applications in drug, and emergency response analyses. Developments have been rapid in portable Raman to address the need for identification of explosives in the field using as simple, safe and reliable fashion as possible.

CHAL 3 [483014]

Mitochondrial DNA Typing For Forensic Analysis.

Kerri A. Dugan, Helen S. Lawrence, and Constance L. Fisher, Forensic Science Research Unit, FBI Laboratory, FBI Academy, Quantico, VA 22135, Fax: 703-632-4557, kdugan@fbiacademy.edu

Mitochondrial DNA (mtDNA) analysis of forensic samples is performed when the quantity and quality of DNA are insufficient for nuclear DNA Analysis or when identification through a

maternal relative is required. The numerous steps from sample extraction to final sequence make the process of determining a mtDNA type both lengthy and labor intensive. The Forensic Science Research Unit conducts research and development projects to explore new technologies and apply them to forensic issues. As molecular techniques evolve, modifications made to existing methods can improve the ability to successfully analyze mtDNA. These changes can be incorporated into casework practices, resulting in a streamlined, less laborious, and technically improved protocol. In addition to addressing the use of mtDNA for forensic analysis, one project focussed on improving DNA extraction methods to efficiently recover high quality DNA from challenging forensic samples such as bone will be discussed.

CHAL 4 [483028]

The CE analysis of forensic samples for poisonous anions.

Mark L. Miller, Janet Doyle, and Robert Gillette, Forensic Science Research Unit, FBI Laboratory, FBI Academy, Building 12, Quantico, VA 22135, Fax: 703-632-4557, mmiller@fbiacademy.edu

The ability to identify poisonous anions in biological specimens and foodstuffs may have significant value in product tampering and homicide cases. Capillary electrophoresis (CE) has demonstrated value in the detection of anions in explosives residue during its use at the FBI Laboratory. A similar system could be useful for anions in toxicology. Currently, research is being conducted to develop a method using CE for the characterization of poisonous anions in food and bio-specimens. The establishment of a protocol for the screening of more than twenty anions in food products and biological specimens is being sought. Preliminary CE testing using a pyromellitic acid indirect UV detection method for foodstuffs spiked with various inorganic compounds and small organic acids has shown that poisonous anions can be detected at the ppm level in these complex matrices. Urine and intestinal contents have also been successfully analyzed.

CHAL 5 [483016]

Elemental profiling of evidentiary materials.

JoAnn Buscaglia, and Robert D. Koons, Forensic Science Research Unit, FBI Laboratory, FBI Academy, Quantico, VA 22135, Fax: 703-632-4557, jbuscaglia@fbiacademy.edu

Forensic Scientists are faced with the comparison and analysis of a wide variety of manufactured materials in the investigation of crime. Classification of and source discrimination among mass-produced products can be accomplished by measurement of their trace elemental profiles. Instrumental methods for the determination of element concentrations in evidentiary materials must be selected with consideration for limited sample size and legal constraints on the destruction of evidence. This paper will introduce the application of elemental analysis methods to the classi-

fication and discrimination of the minute samples encountered in forensic case work, including glass, lead bullets, wires, paint, inks and polymers. Current research efforts involving the direct analysis of solid samples, such as by LA-ICP-MS and TXRF spectrometry will also be presented.

CHAL 6 [483013]

DNA analysis: A tool for resolving violent crime.

Tamyra R. Moretti, Forensic Science Research Unit, FBI Laboratory, FBI Academy, Quantico, VA 22135, Fax: 703-632-4557, tmoretti@fbiacademy.edu, and Barbara W. Koons, Forensic Science Research Unit, FBI Laboratory

An estimated 1.4 million violent crimes were reported in the U.S. in 1999, including 15,533 murders, 89,107 forcible rapes; and 916,383 aggravated assaults. For criminal investigations that involve biological evidence, DNA typing has become a powerful means of determining whether a suspect can be excluded as a potential contributor of an evidence sample. Since the FBI Laboratory conducted its first case involving DNA analysis in 1988, technological progress has reduced cycle time and labor and has enhanced the success rate, detection sensitivity and discriminatory potential of DNA typing. This paper will provide a review of various strategies for forensic DNA typing, including the current technology, short tandem repeat (STR) analysis. Also, the usage of the FBI's national DNA database (CODIS), which allows crime laboratories to electronically compare DNA profiles in order to potentially link serial crimes that were not known to be related and identify suspects previously unassociated with the crime, will be presented.

CHAL 7 [483031]

The evolution of quality assurance practices in forensics DNA analysis.

Richard A. Guerrieri, Quality Assurance and Safety Unit, FBI Laboratory, Washington, DC 20535, Fax: 202-324-1784, labqau@fbi.gov

The field of forensic DNA Analysis has evolved as the technologies have changed. An important aspect of these changes involved the incorporation of quality assurance practices. The Technical Working Group on DNA Analysis Methods (TWGDAM) was started in November 1988, which included 31 scientists from 16 forensic laboratories. This collection of individuals performed the difficult task of documenting and publishing the first DNA quality guidelines in 1989. Congress brought things forward by drafting the DNA Identification Act of 1994. Through this Act, the DNA Advisory Board (DAB) was created. The DNA Identification Act defined the responsibilities of the DAB, which included the evaluation of quality assurance standards for forensic DNA labs. Subsequent meetings resulted in the issuance of the National DNA Standards by the Director of the FBI. The DNA Standards effectively replaced the TWGDAM Guidelines and serve as the quality benchmark for all forensic DNA labs. Recently, the FBI initiated and directed a collaborative effort within the forensic community to develop an audit document based upon the DNA Standards. The completed audit document was released in October 2000, with training on the document currently in progress. The presentation will cover these milestones, as well as provide the attendee with an overview of where DNA quality practices are headed.

CHAL 8 [483019]

Forensic analysis of paint by Pyrolysis-Gas Chromatography-Mass Spectrometry.

James F. Cerven, Research and Development Laboratory, Illinois State Police, 2060 Hill Meadows Drive, Springfield, IL 62702, Fax: 217-557-3989, Jim_Cerven@isp.state.il.us

Paint is submitted to the forensic laboratory from a variety of crime scenes that involve a suspected paint transfer between vehicles and/or other objects. This transfer usually yields minimal retrievable sample for submission to the lab for analysis. However, the forensic laboratory does have many analytic tools for paint comparison and classification that can handle this sample size. These techniques include stereo microscopy, micro-chemical tests, scanning electron microscope-energy dispersive x-ray, Fourier Transform Infrared Spectrometry (FTIR), polarizing light microscopy, pyrolysis-gas chromatography (Py-GC) and Py-GC-MS. Although Py-GC-MS has been available for several years, it is a very powerful techniques that has not reached it full potential for use within the forensic community. This presentation will describe the capabilities of the Py-GC-MS technique as well as advantages that I have experienced in the development and incorporation of this procedure into our laboratory's paint analytical scheme.

CHAL 9 [483020]

Identification of primer gunshot residues by Scanning Electron Microscopy.

Michael A. Kopina, Forensic Science Center at Chicago, Illinois State Police, 1941 West Roosevelt Road, Chicago, IL 60608, Fax: 312-433-8044, kopinam@ispbost.state.il.us

Identification of gunshot residue (GSR) has been an important aspect of criminal investigation for over 50 years. A variety of techniques have been employed to examine various aspects of GSR with the hope of being able to single out the shooter. Most of these techniques determined the total amount of barium, antimony, and lead, the principle inorganic components of primer compositions, in samples from suspected shooters. But the scanning electron microscope (SEM) coupled with energy dispersive x-ray analysis is the only current technique that can provide a particle image and an associated composition, thereby identifying the actual primer gunshot residue particle. The paper will present the background work on the SEM/GSR technique that is currently in use at the Illinois State Police Forensic Science Center at Chicago laboratory. Discussion of the instruments and its operation, particle types, and a few case studies will be presented.

CHAL 10 [483032]:

The role of chemistry in litigation.

Carl Meyer, Law Offices of Carl Meyer, 704 Rand Street, Oakland, CA 94610, Fax: 510-834-0692, cbmeyer@msn.com

The strength of chemistry, and physical science in general, is that facts can be replicated by anyone who has the requisite knowledge, skill and facilities, anywhere and anytime. Thus, by way of example, in environmental and toxic injury litigations, chemistry makes it possible to identify potential defendants, and determine such quantities as the source and source strength of

continued on next page

toxins, compliance with technical standards and regulations; the exposure levels, the dose absorbed and retained by an injured plaintiff, and establish causation. However, success in a litigation depends to an equal level on non-scientific factors and issue, such as the local law; the nature and degree of duty imposed on a defendant, the legal standard for "proximate" causation, and on the credibility of the parties, experts and occurrence witnesses.

CHAL 11 [483018]

The role of the expert, and how to effectively present forensic evidence.

Carl Meyer, Law Offices of Carl Meyer, 704 Rand Street, Oakland, CA 94610, Fax: 510-834-0692, cbmeyer@msn.com

Whether chemistry wins in court depends not only on the quality of the science that forms the basis for the testimony of the expert, but depends equally on other factors, including: (a) the credibility of the parties; (b) the credibility of the expert; (c) the scientific literacy of counsel for the expert; (d) the scientific literacy of the judge; (e) the communication skills of the expert; and (f) early input of the expert. The author will use practical examples from his own expertise as chemical expert and as civil litigator to show why this is the case.

CHAL 12 [483226]

Science and the law on the Hill: The Science Policy Fellowship.

Catherine Woytowicz, ACS Science Policy Fellow, Office of Legislative and Government Affairs, 1155 Sixteenth Street, NW, Washington, DC 20036, Fax: 202-872-6206, c_woytowicz@acs.org

The current ACS Science Policy Fellow—Catherine Woytowicz—will share her "behind-the-scenes" look at decision making in Washington. She will provide an overview of her experience and discuss topics from recent Science & the Congress Project briefings.

CHAL 13 [483022]

The new regulations on Food-Contact Notifications (FCN).

Eric F. Greenberg, Ungaretti and Harris, 3500 Three First National Plaza, Chicago, IL 60602-4283, Fax: 312-977-4405, efgreenberg@ublaw.com

The FDA's most dramatic recent change in the approval options for new food contact substances, the Food Contact Notification program, substantially alters the strategic approach to new product R&D. This presentation will compare the salient procedural and substantive features of FCN's with GRAS determinations, traditional Food Additive Petitions, and other considerations. Packaging R&D activities are clearly being encouraged by the FCN program. It is a significant break from the traditional food additive approval procedure in several respects. It also, however, reflects something of a rebellion against FDA's traditional approach, especially in terms of the timing pressure it imposes. Also changing the regulatory landscape more broadly are important issues such as the emerging battle over the use of dietary supplement ingredients in beverages and foods and FDA's struggle with enforcing the GRAS concept there, and the developing

revolution in free speech regarding label health claims. We are witnessing the signs of a fundamental change in regulatory climate where FDA power to regulate, especially in its traditional manner, is increasingly falling away, reflecting consumer-driven changes in the marketplace, supported by Congress and industry.

CHAL 14 [483026]

An FDA perspective on the Food Contact Notification program.

Michael A. Adams, Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration, Chemistry and Exposure Assessment Team, HFS-246, 200 C Street, Washington, DC 20204, Fax: 202-418-3030, maa@cfsan.fda.gov

The perspective of the FDA on their new Food Contact Notification (FCN) program will be presented.

CHAL 15 [483035]

Active and intelligent packaging is here; Can current regulations be used?

Peter N. Gray, Bern#rd Technologies, Inc, 919 N. Michigan Ave, Suite 1710, Chicago, IL 60611, Fax: 312-337-0505, btipng@attglobal.net

Exciting new technologies for maintaining food quality, extending freshness, and perhaps reducing microbial food contamination are being developed. These active and/or intelligent packaging systems offer challenges to the regulatory agencies because regulations and guidelines usually were created to match the packaging components and technology of the time. New systems often use existing well known and allowed compounds but delivered in different ways. Rather than taking something out of the package environment, such as oxygen or ethylene, the new active systems may generate, on demand, controlled amounts of previously approved compounds in the package environment. These new systems are designed to be cost effective, compatible with existing packaging manufacturing equipment and practices, and transparent to both the converter and the customer. Used in conjunction with good hygiene, HACCP and other product specific packaging, these new systems offer the food and consumer product producers and processors additional safety hurdles in their efforts to supply high quality safe products. There are appropriate cautions that must be addressed, such as not eliminating spoilage perception; however, the main concerns for both the system developer and the regulatory bodies relate to taking positive actions in the background of historical rules and changes requiring thorough deliberation.

CHAL 16 [483024]

Food Contact Materials (FCM) experience: Problems and approaches.

Gavin P. Thompson, Senior Science Advisor, Environ International Corp, 4350 N. Fairfax Drive, Suite 300, Arlington, VA 22203, Fax: 703-516-2393, gthompson@environcorp.com

The typical exposure assessment for a food-contact material focuses on the potential ingestion of chemical constituents that may migrate from the food-contact material to the food. Indeed, this pathway - often referred to as "indirect ingestion" - is frequently the only exposure pathway considered when esti-

mated daily intakes (EDIs) are developed for components of a food-contact material. However, with the ever-increasing complexity, variety, and utility of food-contact materials, routes of exposure other than ingestion may need to be considered. Exposure assessments incorporating inhalation and dermal absorption pathways are presented. The relevance of these pathways is evaluated by estimation of the pathway's contribution to total estimated exposure, i.e., as a percentage of the estimated indirect-ingestion exposure level. Food-contact materials used in high-temperature conditions, such as in a conventional radiant-heat oven or in a microwave oven, may present exposures via the inhalation route. Examples of exposure modelling of potential releases of volatile organic chemicals (VOCs) from food-contact materials used in ovens are presented. In addition, dermal exposure modelling of an institutional food service container also is presented. Modelling of potential inhalation and dermal exposure levels typically results in insignificant exposure levels in the home environment (as compared to the indirect-ingestion route). However in the workplace, exposures via inhalation of volatilized components and dermal contact with containers may present exposures not anticipated by the typical indirect-ingestion assessments. Thus, depending on the intended uses and composition of the food-contact material, the consideration of potential inhalation and dermal absorption pathways, as contributors to the total estimated level of exposure, may be warranted.

CHAL 17 [483290]

Analytical methodologies employed in FDA food contact compliance investigation.

Jeffrey S Eberhard, Study Director, Covance Laboratories, Agrosiences and Industrial Chemistry, PO Box 7545, Madison, WI 53717-7545, Fax: 608-664-3022, jeffrey.eberhard@covance.com

ANALYSES FOR RESIDUAL MONOMERS, RESIN OLIGOMERS, ADDITIVES AND MODIFIERS IN SEVERAL FOOD SIMULATING SOLVENTS-FDA mandates and product stewardship concerns have given rise to challenging analytical problems. This is evident when considering the potential migration of constituents of a polymer formulation intended for food contact applications. Residual monomers, resin oligomers, additives and modifiers must all be considered in the evaluation of potential human health impact. In this paper we present a series of analytical methodologies that address these concerns. Liquid and gas chromatography and mass spectroscopy are used to quantitate the migration of a number of representative compounds from polymeric formulations intended for food contact applications.

CHAL 18 [483025]

Irradiated polymer submissions to the FDA: Unique problems and approaches.

George D. Sadler, and Elena Miller, National Center for Food Safety and Technology, 6502 S. Archer Road, Summit-Argo, IL 60501, Fax: 708-563-1873, sadler@iit.edu

Most submissions to the FDA have a good a priori understanding of the compounds that must be detected before analysis is undertaken. Polymer irradiation submissions differ in that a broad array of compounds are produced with assorted chemical functionalities. This introduces additional complexities in the

analysis and validation of the data. It also introduces added hurdles to FDA submissions. For example, it is intractably difficult to provide standards for vast array of compounds produced in some polymers upon irradiation. Counter approaches are discussed including GC/MS response models, mathematical simulations, diffusion models and assumptions of practical barriers.

CHAL 19 [483402]

Protecting your innovations.

Robert W. Fieseler, McAndrews, Held & Malloy, Ltd, 500 W Madison Street, Suite 3400, Chicago, IL 60661, Fax: 312-775-8100, rfieseler@mbmlaw.com

Successful technology-based companies rely upon innovation and creativity to develop products and services that are protected by patents or maintained as trade secrets. Practical guidelines are provided in this presentation for identifying, documenting, evaluating and securing patent and/or trade secret protection for a company's innovations and the corresponding products and services embodying those innovations.

CHAL 20 [483405]

Avoiding pitfalls in inventorship determinations.

Edward W. Remus, McAndrews, Held & Malloy, Ltd, 500 W Madison Street, Suite 3400, Chicago, IL 60661, Fax: 312-775-8100, eremus@mbmlaw.com

Who is the inventor? Avoiding pitfalls in identifying those who should be named as inventors on United States patent applications.

CHAL 21 [483406]

A primer on patent interferences.

Herbert D. Hart III, McAndrews, Held & Malloy, Ltd, 500 W Madison Street, Suite 3400, Chicago, IL 60661, Fax: 312-775-8100, hbhart@mbmlaw.com

What is a patent interference? A primer for scientists and business managers who may become involved in these special proceedings in the US Patent and Trademark Office.

CHAL 22 [483404]

Recent case law developments.

George F. Wheeler, McAndrews, Held & Malloy, Ltd, 500 W Madison Street, Suite 3400, Chicago, IL 60661, Fax: 312-775-8100, gwheeler@mbmlaw.com

Recent case law developments in chemical patent cases decided by the Court of Appeals for the Federal Circuit.

CHAL 23 [483401]

Everyday inventions of African-Americans.

Howard M. Peters, Peters, Verny, Jones and Biksa, LLP, 385 Sherman Avenue, Suite 6, Palo Alto, CA 94036, Fax: 650-324-1678, peters4pa@aol.com, and Sally Peters, Xerox-Parc

The American Chemical Society has embarked on a major program to encourage and support women and minorities in the chemical sciences. It is not generally known that some impor-

continued on next page

tant, now very common everyday, items were invented and patented by African-Americans. Patents and posters include: Dr. Charles R. Drew, U.S. No. 2,301,710 for blood banking (American Red Cross); Garrett A. Morgan, U.S. No. 1,475,024 for a traffic signal; Fred Jones, U.S. No. 2,475,841 for a refrigerated truck; J. L. Love, U.S. No. 594,114 for an early pencil sharpener; W.B. Purvis, U.S. No. 419,065 for a fountain pen; W. Johnson, U.S. No. 292,821 for an early egg beater; Thomas W. Stewart, U.S. No. 499,402 for a mop handle connector; and G.F. Grant, U.S. No. 638,920 for an early wooden golf tee.

CHAL 24 [483397]

MONOPOLY: The board game-U.S. Patent 2,026,082.

Howard M. Peters, Peters, Verny, Jones and Biksa, LLP, 385 Sherman Avenue, Suite 6, Palo Alto, CA 94036, Fax: 650-324-1678, peters4pa@aol.com, and Sally Peters, Xerox-Parc

Monopoly, the board game of chance, was invented in the middle of the Great Depression and patented by Charles Darrow as U.S. Patent 2,026,082 on December 31, 1935. The game proved to be very popular and is still a major source of revenue for Parker Brothers. The U.S. Patent expired in 1952, but the innovation is now protected by trademark and copyright. Trademarked articles and copyrighted articles are presented.

CHAL 25 [483400]

Surprising patents and inventions of famous people.

Howard M. Peters, Peters, Verny, Jones and Biksa, LLP, 385 Sherman Avenue, Suite 6, Palo Alto, CA 94036, Fax: 650-324-1678, peters4pa@aol.com, and Sally Peters, Xerox-Parc

Many famous people in careers unrelated to science and technology have obtained patents over the years. The patents presented include: Heddy Lamar, U.S. No. 2,292,387 (actress) for secret communication system (for torpedos); Mark Twain, U.S. No. 140,245 (author) for a scrapbook; Lillian Russell, U.S. No. 1,014,853 (actress) for a dressing trunk; Edger Bergen, U.S. No. Des. 129,255 (ventriloquist) for a fishy doll; Glenn (Pop) Warner, U.S. No. 1,887,473 (coach) for a football shoulder protector (Palo Alto); Jack Johnson, U.S. No. 1,413,121 (prizefighter) for a wrench; Paul Winchell, U.S. No. 3,097,366 (ventriloquist), for a heart machine; and Julie Newmar, U.S. No. 4,003,093 (dancer and actress/the Catwoman) for cheeky stockings.

CHAL 26 [483399]

You don't need to be a rocket scientist to be an inventor.

Howard M. Peters, Peters, Verny, Jones and Biksa, LLP, 385 Sherman Avenue, Suite 6, Palo Alto, CA 94036, Fax: 650-324-1678, peters4pa@aol.com, and Sally Peters, Xerox-Parc

Simple toys and games have been patented and are then later protected by copyright and trademark in the marketplace. Representative common and toy patents include: the KOOSH ball, U.S. No. 4,756,529; the FRISBEE, U.S. No. 3,350,678; Paper Cup Sleeves, U.S. No. 5,425,497; Paper Cup Spill Resistant Lids, U.S. No. 5,589,569; McDonald's French Fry Sleeve U.S. No. 3,630,430 & Clam Shell Container U.S. No. 5,205,476; the

SLINKY, U.S. No. 2,415,012; SILLY PUTTY, PLAY DOH, & HYDROGELS, U.S. No. 4,369,284; a robot (R2D2), U.S. No. Des 251,628; and the AEROBIE, U.S. No. 4,560,358.

CHAL 27 [483384]

2001 Inductees to the National Inventors Hall of Fame.

Howard M. Peters, Peters, Verny, Jones and Biksa, LLP, 385 Sherman Avenue, Suite 6, Palo Alto, CA 94036, Fax: 650-324-1678, peters4pa@aol.com

In September 2001, The National Inventors Hall of Fame (NIHF) will induct about 10 new inventors into the Hall. Those inventors so honored will be identified including their patented inventions. The National Inventors Hall of Fame (NIHF) celebrates the creative and entrepreneurial spirit of great inventors. The creative genius of invention is showcased through exhibits and presentations which allow visitors to experience the excitement of discovery, creativity and imagination. The NIHF furthers the inventive spirit to address specific problems of declining technological leadership and creativity in America. The NIHF was established in 1973 by the National Council of Patent Law Associations, now the National Council of Intellectual Property Law Associations, and the Patent and Trademark Office of the U.S. Department of Commerce. The National Inventors Hall of Fame Foundation was created to administer it. National Inventors Hall of Fame, 221 S. Broadway St, Akron, OH 44308-1505. www.invent.org

CHAL 28 [483391]

Death by chocolate: A brief history of chocolate.

Howard M. Peters, Peters, Verny, Jones and Biksa, LLP, 385 Sherman Avenue, Suite 6, Palo Alto, CA 94036, Fax: 650-324-1678, peters4pa@aol.com, and Sally Peters, Xerox-Parc

Chocolate was eaten and drunk by the natives of Central and South America long before Columbus. Chocolate taken to Europe was touted as having a variety of medicinal uses. In the 1800's chocolate production increased greatly because of the mixing of chocolate with milk products. A brief history of chocolate as food and drink is presented. Several chocolate references will be provided. Guittard Chocolate, the See's Candies chocolate supplier, will be available.

CHAL 29 [483389]

Dr. George Washington Carver, Peanut Products and Patents.

Howard M. Peters, Peters, Verny, Jones and Biksa, LLP, 385 Sherman Avenue, Suite 6, Palo Alto, CA 94036, Fax: 650-324-1678, peters4pa@aol.com, and Theresa M. Peters, Mayfield School

George Washington Carver was born of slave parents in Diamond Grove, MO. In 1887 he was accepted at Simpson College in Indianola, Iowa. He attended Iowa Agriculture College (now Iowa State University) and earned a B.S. in 1894 and an M.S. in agriculture in 1897. Booker T. Washington, founder of the Tuskegee Normal and Industrial Institute for Negroes, convinced Carver to serve as the school's director of agriculture. Carver

developed 325 uses for peanuts—from cooking oil to printer's ink—and helped to create new markets. When he discovered that the sweet potato and the pecan also enriched depleted soils, Carver found almost 200 uses for those crops, including synthetic rubber and material for paving highways. He synthesized organic dyes, which proved to be superior to the imported ones. Upon his death on January 5, 1943, Carver contributed his life savings to establish a research institute at Tuskegee. His birth place was declared a national monument in 1953. (Inducted into NIH in 1990). Programs to foster public recognition of his accomplishments are shown.

CHAL 30 [483390]**Dr. Percy L. Julian - Preparation of Cortisone, U.S. Patent 2,752,339.**

Sally Peters, Xerox-Parc, 3333 Coyote Hill Road, Palo Alto, CA 94304, Fax: 650-812-4028, speters@parc.xerox.com

Percy Lavon Julian, the grandson of former slaves, was born in Montgomery, AL on April 11, 1889. Julian graduated in 1920 from DePauw University as class valedictorian with Phi Beta Kappa honors. With no scholarship aid he went to Fisk University to teach chemistry. In 1923, with an Austin Fellowship in Chemistry, he earned a Master's degree from Harvard. After teaching at West Virginia State College and Howard University, Julian received his Ph.D. in Organic Chemistry from the University of Vienna in 1931 under the direction of Ernst Spath. Julian was noted for his synthesis of cortisone, used in the treatment of rheumatoid arthritis and other inflammatory conditions. Julian's method of synthesis reduced the price of cortisone extracted from oxen bile at high cost. He died in 1975. (NIHF inductee 1990).

CHAL 31 [483392]**Milton S. Hershey - One of a kind, founder of the Hershey Chocolate Company.**

Howard M. Peters, Peters, VERNY, Jones and Biksa, LLP, 385 Sherman Avenue, Suite 6, Palo Alto, CA 94036, Fax: 650-324-1678, peters4pa@aol.com, and Shirley B. Radding, Tetrac

Milton S. Hershey founded and incorporated the Hershey Chocolate Company in 1901. It has become the giant international Hershey Foods Company of Hershey, PA. Mr. Hershey believed more in trade secrets than in patents, hence the company had only three US Patents before his death at 88 in 1945. Hershey's sole U.S. Patent 1,740,693 was to a process of purifying sugar. Copies of these U. S. patents will be presented, as well as some representative U.S. trademarks. A portion of this presentation will be devoted to the life and the \$5,000,000,000 philanthropic foundation of Mr. Hershey.

CHAL 32 [483393]**Norbert Rilleux - Sugar Chemist.**

Howard M. Peters, Peters, VERNY, Jones and Biksa, LLP, 385 Sherman Avenue, Suite 6, Palo Alto, CA 94036, Fax: 650-324-1678, peters4pa@aol.com, and Shirley B. Radding, Tetrac

Norbert Rilleux was a 19th Century inventor who greatly

improved the process to convert sugar cane to sugar. The old process using fire at atmospheric pressure was slow, inefficient and labor intensive. The old process was often called "the Jamaica Train." Rilleux's U.S. Patent 4,897 described a reduced atmosphere evaporation that was cost effective and very efficient. It revolutionized the sugar industry in Louisiana and elsewhere. Rilleux was an African-American cousin of Impressionist French Painter, Edgar Degas. Rilleux eventually became so dissatisfied with race relations in New Orleans in the 1850's that he moved back to Paris and never returned to the U.S.

CHAL 33 [483441]**Drug Wars: Waxing philosophic over Hatch-Waxman.**

Charles R. Krikorian, Welsb & Katz, Ltd, 120 S. Riverside Plaza, 22th Floor, Chicago, IL 60606, Fax: (312) 655-1501, crkrikorian@welsbkatz.com

The Hatch-Waxman amendments to the Food, Drug and Cosmetics Act and the patent statutes were designed to facilitate entry of generic drugs into the marketplace, while providing appropriate protections to the research and development efforts of innovator drug companies. The courts have been policing the crossroads of science and the law in attempting to interpret this complex statutory scheme. Meanwhile, Congress is considering re-entering the fray, seeking to curb alleged "abuses" of the law by both generic and innovator companies. In addition, the law as it currently stands does not appear to cover "biologics" over against traditional "drugs." An overview of the legal framework, as well as the implications of new legal and scientific developments, will be presented in this talk.

CHAL 34 [483412]**Broad Claims in an Ever-Shrinking Universe.**

Shannon L. Nebolsky, Welsb & Katz, Ltd, 120 S. Riverside Plaza, 22nd Floor, Chicago, IL 60606, Fax: 312-655-1501, SLNebolsky@WelsbKatz.com

Chemical and biotechnology patent claims have become increasingly narrow. However, recent case law suggests that broader coverage is available, if properly sought. This talk will suggest strategies for the inventor and patent practitioner to obtain broad claims that should survive in the post-Festo universe.

CHAL 35 [483133]**Pre-grant publication of patent applications in the U.S.**

Brian C. Meadows, Needle & Rosenberg, PC, 1200 Candler Building, 127 Peachtree St., Atlanta, GA 30303, Fax: 404-688-9880, meadows@needlepatent.com

Perhaps the most significant changes in patent practice before the United States Patent and Trademark Office in recent years have come in the midst of Congress' passage of Subtitle E of the American Inventor's Protection Act of 1999. Among its numerous and far reaching impacts on patent practice, Subtitle E amended 35 U.S.C. 122 and spurred the implementation of corresponding rules to statutorily require the publication of most patent applications that are filed on or after November 29, 2000, 18 months after the earliest effective filing date or priority date claimed by the application. The first of such applications began publishing

continued on next page

on March 15, 2001. This presentation will look at pre-grant publications and its impact on the patenting process.

CHAL 36 [483385]

The revised guidelines for utility and written description and what they mean for the inventor in the chemical or biological sciences.

David E. Huizenga, Needle & Rosenberg, PC,
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Fax: 404-688-9880, huizenga@needlepatent.com

A patent applicant must meet a number of requirements before the United States government will issue him or her a patent. In the chemical and biological sciences two of those requirements, inventing something having a utility and providing a written description of the invention, can be very difficult to comply with. The United States Patent and Trademark Office recently issued revised guidelines for the examination of patent applications for compliance with the utility and written description requirements. In general these new guidelines have placed a greater burden on the patent applicant. The potential pitfalls caused by the new guidelines for the chemical and biological arts are discussed as well as practical solutions patent applicants can pursue to maximize their patent protection.

CHAL 37 [483134]

Practical Tips on Dealing with Recent Changes in the Law.

William R. Johnson, Needle & Rosenberg, P.C.,
1200 Candler Building, 127 Peachtree Street, N.E, Atlanta,
GA 30303, Fax: 404-688-9880, johnson@needlepatent.com

Recent changes in the law—both statutory and case law—will have a significant impact on the patenting process. These changes go beyond the application itself and impact strategy issues from basic filing decisions (if, where, when and how) to the enforcement of your rights. This presentation will look at a number of the changes and offer guidance on how to make the law work best for you.

12 BENEFITS OF ACS DIVISION MEMBERSHIP

Whether you join CHAL or several ACS Divisions, you will find your professional life enhanced – by new knowledge, new contacts, and new accomplishments. Division membership affords unique benefits – at modest cost. Among the benefits most valued by division members are:

1. Access to national meeting abstracts, preprints, and/or reprints of papers
2. Enhanced opportunities to present papers at national and divisional meetings
3. Substantial savings on publications
4. Career advancement through professional development and networking opportunities
5. Advance notice of upcoming events
6. Membership directories
7. Scientific and technical exchange with colleagues that sparks new directions in your work
8. Timely information on the latest trends in areas of special interest
9. Enthusiasm and renewed commitment to your professional goals
10. Recognition of your discipline's vital contribution to chemistry's advancement
11. Opportunity to suggest symposia topics and participate in technical programming
12. Continuing education and professional development opportunities

Mission/Goals of CHAL

The mission of the Division of Chemistry and The Law is to provide a forum within ACS for members who work in careers involving the interaction of Chemistry and The Law. Some typical examples would include chemists and chemical engineers working in the fields of patents, copyright, trademarks, intellectual property, occupational health and safety, regulatory compliance, forensic science, product liability, toxic tort and environmental law.

Our goals are to provide an interactive forum for chemists who work in these positions, to provide Division members and the ACS membership at large with high quality, inter-disciplinary programs, symposia, and publications in these areas, and to promote and increase the public understanding of chemistry and its interactions with the law.

We also desire to expose ACS members (chemists, chemical engineers, and students) to alternative career opportunities which provide an interdisciplinary challenge, between chemistry and its application to areas of law, and in law and its applications to chemistry.

Membership Report

The ACS Division, Chemistry and The Law (CHAL), continues to grow. On 30 April the total count was 1064. There were 1026 Members, 17 National Affiliates, and 21 Division Affiliates. The growth rate in 2000 was an outstanding 12 %. In the first four months of 2001 we have added 118 new members including 72 who are also new ACS members who chose CHAL as their one "free" division for 2001. In the same period, there were 9 reinstatements or transfer in and 48 resignations. The net gain for the first four months of 2001 is +79.

If you have neglected paying your dues, please do it now. Please pay your share which allows the Division to function, program excellent symposia and deliver this Newsletter.

The continued growth of our Division is dependent upon high quality programming at both national meeting and the participation of all our members. Please network with each other and especially with the new members. If you are interested in contacting some of the new members, I can provide CHAL members with E-mail addresses for 110 of the 120 new members. Jack Riley, membership chair, my address is: jfriley@atdial.net.

Here are the names of the 120 new members for 2001:

| | | | | | |
|---------------------|-------------------|---------------------|--------------------|-----------------------|-------------------------|
| AMBROGIO, DAWN | Lutz, FL | GANDHI, JITU | Cleveland, OH | NGUYEN, LAUREN | Arlington, VA |
| ANDERSON, PHILIP | Mobile, AL | GOLDMAN, DANIEL | Edison, NJ | NOVAK, JUDITH | Los Angeles, CA |
| ANTHONY, KIMBERLY | Richmond, VA | GOLIGHTLY, ERIC | Houston, TX | O'HARA, MICHAEL | Washington, DC |
| ATTICKS, KARISSA | Storrs Manfld, CT | GOMEZ, NESTOR | Bogota, COLUMBIA | PEREZ, WILMA | Brooklyn, NY |
| BARNETT, PHILLIP | Chicago, IL | GRAVES, ANN | Winston Salem, NC | PRING, BRIAN | Sodertalje, SWEDEN |
| BARR, LINDA | Irvine, CA | GREEN, KRISTY | Angie, LA | PUNDAK, SHLOMO | Beersheba, ISRAEL |
| BELFIELD, JING | Wilmington, DE | HACKETT, EMILY | Nashua, NH | QUINN, WILLIAM | Gracewood, GA |
| BERKOWITZ, TRACY | Sudbury, MA | HART, HERBERT | Chicago, IL | RAMILLANO, LORE | Los Angeles, CA |
| BLIZZARD, STEPHAN | Elkview, WV | HART, LAUREN | Montgomery Vlg, MD | RAPHAEL, COLLEEN | Madison, WI |
| BRAMBLE, LINDA | Saranac, MI | HELLMUTH, KELLY | Middleburg, FL | REEVES, WILLIAM | Appleton, WI |
| BRITT, GEORGE JR | Philadelphia, PA | HO, DAVID | Walkersville, MD | REHBORN, DIANA | Raritan, NJ |
| BRUSTEIN, MITCHELL | Philadelphia, PA | HORSMAN, KATIE | Battle Creek, MI | ROBERTSON, TERESA | Bakersfield, CA |
| BUCK, JASON | Nashville, TN | HUNT, SONIA | Seattle, WA | ROBIDOUX, ANDREA | Cambridge, MA |
| BURCH, MARCUS | Mount Vernon, IA | JOHNSON, DAVID | Houston, TX | SANTARCANGELO, CHRIS | Milford, CT |
| BYRNES, TIMOTHY | Bethel Park, PA | JOHNSON, TIMOTHY | San Jose, CA | SCHAAL, ERNEST | Mill Valley, CA |
| CARBINE, COLLEEN | Miami, FL | JOSLYN, KRISTIN | New York, NY | SCOTT, FRANCES | Woodbridge, VA |
| CASTELLANO, LOIS | New Brunswick, NJ | KABACK, STUART | Cranford, NJ | SGANGA, JEANMARIE | San Francisco, CA |
| CHAKROBORTY, RAM | Chicago, IL | KATO, TOMA | Yokohama, JAPAN | SHAHRIARI, DEAN | Evanston, IL |
| CHARAN, ROMILA | Germantown, MD | KAVANAUGH, THERESA | Lexington, MA | SHANER, SANDRA | New Haven, CT |
| CHAVEZ, ULISES | Mobile, AL | KLETZLY, PAUL | Baltimore, MD | SINGLETON, CHAINEY | Concord, NH |
| CHEVALIER, CHARLES | Rahway, NJ | KOROMA, MOHAMED | Hollywood, CA | SIRMONS, CEDRIC | Savannah, GA |
| COMPHER, KEVIN | Philadelphia, PA | KOSCHMIEDER, STEFAN | Arlington, VA | SIT, YEU | Rockville, MD |
| CONGER, WILLIAM | Southfield, MI | KOTORA, GORDON JACK | Clifton, NJ | SPENCER, ROXANNE | Plainsboro, NJ |
| DAMICO, MICHELLE | East Liberty, PA | KURPLE, KARL | Casco, MI | STEPHENS, BARBARA | Deepwater, NJ |
| DE CHEKE, MICHAEL | Easthampton, MA | KVANTAS, RENATA | Northbrook, IL | SUGGS, JAMES | Corning, NY |
| DEAN, RODNEY | Charlotte, NC | KVATERNICK, VALERIE | Iselin, NJ | SUNICK, DEBORAH | Durham, NC |
| DEEMIE, ROBERT | Reston, VA | LIKES, BRANDY | Clayton, MO | SZABO, ELEK | Boston, MA |
| DELONG, JOHN D | Akron, OH | LIPPENBERGER, CARL | Corte Madera, CA | TANG, LAM | Sunnyvale, CA |
| DONNELL, ALEXANDER | Colonie, NY | MALEK, KEVIN | Los Angeles, CA | THOMAS, DAVID | Phillipsburg, NJ |
| DOWD, MATTHEW | Washington, DC | MAYHUGH, JAMES | Culloden, WV | TONG, CONNIE | Newport Beach, CA |
| DUELTGEN, RONALD | Eagan, MN | MCNEMAR, ROBIN | Huntingdon VY, PA | TRUDEAU, MARTIN | Tewksbury, MA |
| DUGAN, ANTHONY | Canton, OH | MEADE, ERIC | Princeton, NJ | TURNER, CHRISTINE | Bossier City, LA |
| EBERHARD, ELLEN | Urbana, IL | MILLER, ALAYNA | Dallas, TX | UMBACH, NOELLE J | New York, NY |
| ENDRES, STEPHEN | Groton, CT | MINGO, PAMELA | Gurnee, IL | UMILE, ROBERT | Claymont, DE |
| EVERS, DAVID | Ann Arbor, MI | MISKIEL, FRANK | San Diego, CA | VAN GASTEL, FRANCOISE | CANADA |
| FARQUHARSON, SERENA | Dz, NC | MORALES, GUILLERMO | Santa Clara, CA | VU, DARLENE | Santa Ana, CA |
| FGHENAKIS, V M | Deer Park, NY | MORING, WENDY | Chandler, AZ | WADE, JANICE | South San Francisco, CA |
| FOGEL, LOUIS | Chicago, IL | NACKOVIC, VERA | Burns Harbor, IN | WEBSTER, MELISSA | Olathe, KS |
| | | | | WILLIAMS, CAROLYN | Mahwah, NJ |
| | | | | WILSON, JENNIFER | Chattanooga, TN |
| | | | | WINESETT, NATHAN | Omaha, NE |
| | | | | WINTER, MARK | Indianapolis, IN |
| | | | | YEE, DAVID | Hicksville, NY |
| | | | | YOUNG, TOM | Tucson, AZ |

Membership

Application blanks are part of this Newsletter. Ask a colleague to join you in the Best Division in the ACS. Personal invitations support our growth.

Minutes of the Executive Committee Meeting

Sunday, April 1, 2001 • San Diego

After a reception at the Napa Valley Grill in Horton Plaza, hosted by Campbell & Flores LLP, the Executive Session meeting was held in a private room at the same location.

The Executive Session began at 6:30 P.M. with the following in attendance: Cathryn Campbell, Hugh Dubb, Laurelee Duncan, Alan Ehrlich, Michael Grossman, Chuck Hauff, David Jaffer, David Ladner, Barbara Lences, Valerie McDevitt, Carl Meyer, Howard Peters, Jack Riley, Alice Robertson, Teresa Welch.

Webmaster's Report: The division's webmaster, Laurelee Duncan, presented the first report, as she had to leave early for another engagement. Ms. Duncan and Michael Grossman, the newsletter editor, discussed the plan to put the newsletter on the website. Copyright issues in reproducing the newsletter on the website were discussed because of the inclusion of an article in the newsletter from the Baltimore Sun. Officer contact information will continue to be posted on the web. A discussion of putting the division directory on the web was tabled until the Chicago meeting in August 2001, as the ACS is moving toward such directories but security measures are currently in the process of being implemented by ACS.

Correction and Approval of

Minutes: After Ms. Duncan's report, the Executive Session returned to its normal order. The minutes printed in the Spring 2001 newsletter indicated that Alice Robertson was a liaison from CHAL to the Divisional Activities Committee. In fact, Alice was an associate of the Council Committee on Divisional Activities last year (and is now a member) and acts as DAC's liaison to the Division of Chemistry and Law. Jack Riley and Howard Peters were listed as councillors from

CHAL in the minutes. This was corrected to indicate that Alice Robertson and Howard Peters are the division councillors. Hugh Dubb, archivist for the division, noted his request at the last meeting that members forward materials for the archives to him. Hugh has not received any materials and wanted the minutes to reflect his prior and continuing request for these materials. With these corrections, the minutes of the Fall 2000 meeting were approved.

Chair's Report: Chuck Hauff presented the Chair's report. Chuck first requested that all members of the Executive Committee ask someone to join CHAL this year. Chuck's invited new ideas to make CHAL more effective as a division. The following suggestions were made: (1) make better use of the website; (2) make information more easily available for members about operations and programming of the division; (3) create better communication between the division and the Divisional Activities office; (4) clean up the roster to remove unpaid members; (5) review our success at keeping members from last year who received their initial year of membership free; (6) do a better job of contacting new members when they join; (7) broaden membership with broader programming; (8) use meeting times more efficiently to focus on important issues; (9) broaden the focus of programming through joint programming with other groups; (10) put meeting presentations into the newsletter or on the website; (11) prepare a guide for guest speakers and symposia organizers so that this information is readily available for guest speakers and those organizing programs; (12) do a directory for the division; (13) seek challenge grants from members to provide for expanded activities of the division;

(14) initiate a speakers' list for local sections and regional meetings; (15) provide symposia at regional meetings; (16) establish more interaction between the division and local sections; (17) make sure the full program gets into the newsletter as some programs were left out this time; and (18) Executive Committee teleconferences on a monthly basis to keep the ball moving and to move some issues to task groups.

Chuck Hauff set a first teleconference for the Executive Committee at 1:30 P.M. Eastern time on Tuesday, April 10. Items moved to the telephone conference were: providing guidelines for the program chair and membership letters to new members. Chuck then discussed the Presidential Task Force on support to local sections and divisions. This task force's charge is to provide funding to underfunded sections and divisions. Alice Robertson, Barbara Lences, and Valerie McDevitt were appointed to track the guidelines, and then to see if the division can prepare a proposal that will qualify for funding of programming. Chuck Hauff and Barbara Lences discussed funding by Corporate Associates. Chuck agreed to get the applications to Mitch Katz, so they can be provided to the program chairs for the Chicago meeting.

Cathryn Campbell volunteered to put together a program on careers for women in chemistry, with an application to the Divisional Activities Committee to get funding for the program. The program would be at the Orlando or Boston meeting. Preparation of the annual report for 2000 and 2001 was discussed, with the conclusion that the best way to gather the information is for the treasurer to continue to prepare the treasurer's report and for the secretary to solicit the information

necessary to complete the secretary's report from members of the Division. The Bylaws were discussed. Shirley Radding, Jack Riley and Howard Peters were charged with reporting all recommended Bylaws changes at the Fall 2001 meeting in Chicago.

Lifetime Achievement Award to

Jack Riley: In the middle of the Chair's report, the Executive Session was interrupted by fireworks being shot off over San Diego Bay. Chair Chuck Hauff took the opportunity to present Jack Riley with a lifetime achievement award for his service to CHAL. The award included a clock with a plaque recognizing Jack's many contributions to CHAL over the years.

Secretary's Report: David Jaffer reported that the Secretary's report for 2000 is in preparation, and he will contact members of the section to gather information necessary to finalize the report.

Treasurer's Report: Barbara Lences presented a written treasurer's report for the period January 1, 2001 through March 30, 2001. Barbara noted that the Division is solvent, but barely. Only \$400 was available in the Division's checking account in February. The contribution of Fox Kiser to the Education Fund of \$2,500 was noted, particularly in view of the possible insolvency of the Division had this contribution not been received. Mechanisms for reducing costs of the Division (which are dominated by production and distribution of the newsletter) and generating additional revenue for the Division were discussed.

Newsletter Editor's Report: Michael Grossman reported on the first edition of the newsletter for which he was editor, with consultation from Shirley Radding. The transition has gone smoothly. Chuck Hauff and Barbara Lences are to follow-up on the potential for lowering costs of layout and printing. Michael noted the difficulty of getting articles and asked that

members submit articles. In addition, a solicitation for advertising in the newsletter will continue to be printed, although it did not appear in the most recent issue. Timing and mailing of newsletters to ensure that they arrive on time was discussed. June 1 was set as the deadline for receiving items and July 1 as the date for mailing of the Fall newsletter, so that members will receive the program prior to the end of registration for the Fall meeting.

Nominating Committee: The Bylaws call for nomination of new officers by May 15. Chuck Hauff appointed a committee of the past chair (Allen Ehrlich), current chair (Chuck), and the Chair-Elect (Carl Meyer) to serve as the Nominating Committee.

Roger Middlekauf Award: Howard Peters was appointed to head the Committee for this award for the Fall meeting.

Councillors' Report: Howard Peters reported on the issues before the Council. These include changing the size of standing committees from 6 to 12, and changing the requirements for membership to allow those with 2 year degrees in chemical sciences and 5 years of employment to qualify for ACS membership without special dispensation. Howard noted that there are four nominees for President.

DAC Report: Alice Robertson reported that a new person has been assigned responsibility for meetings and expositions, and that Chris Pruitt has moved to another job in the Society.

Program Chair's Report: Mitch Katz and his co-chair, Bill Johnson, were unable to attend the meeting; but see the Program Chair's Report in this issue of the newsletter.

Membership: Jack Riley, the Membership Chair, reported that total membership increased by 14% (from 1,033 to 1,164) from December 1999 to December 2000. There are a number of members with unpaid dues, whom Chuck Hauff and Jack Riley will

contact to request that they continue as members of the section. Jack noted again that he would like to see an analysis of how successful we are with renewals of those who were given free membership in the division last year in their first year of ACS membership.

Review of Goals: Chuck agreed to review the goals set at the beginning of the meeting to focus on ways to further the goals of the Division.

The business of the Executive Committee was finished at 8:50 P.M.



CHAL Areas of Chemistry and Related Sciences

- Intellectual Property
- Copyright
- Patents
- Trademarks
- Trade Secrets
- Contract Law
- Employment Agreement
- Professional Ethics and Liability
- Product Liability
- Tort Law
- Expert Witnesses
- Chemical Consulting
- Chemical Health and Safety
- Chemical Information
- Forensic Chemistry
- Food and Drug Law
- Regulatory Law
- Administrative Law and Rule Making
- Biotechnology
- Licensing and Technology Transfers
- Litigation



[Monsanto v Schmeiser]^{1,2}

Earlier this year judgment was given against a Saskatchewan³ farmer in favor of a large U.S.-based agricultural company for patent infringement.⁴ The Federal Court of Canada found that Monsanto was entitled to a patent for its genetically modified canola seed, and to impose various requirements, to its own commercial advantage, upon farmers to whom it granted licence under the patent. The patented design allowed the resultant canola to be resistant to a widely-used Monsanto herbicide, to the commercial advantage of the licenced farmers. Issues of fact and law were considered. The defendant farmer did not licence the product, but the court found, contrary to his claims, that he wrongly used it anyway. That the product seeds might have been wind-blown from near-by, and that the farmer did not use Monsanto's herbicide, did not matter in the court's judgment.

According to the farmer's Internet site⁵ this was David and Goliath. But the biblical⁶ Goliath lost and David didn't have to pay damages.

The court's upholding of Monsanto's patent and related commercial contract rights is not surprising for Canadian law, especially in the modern free trade era. Arguably the issues are political, and antitrust-legal, rather than patent-legal. Curiously, antitrust issues were not raised. Would U.S. antitrust law be applicable in this case?⁷

The case text is excerpted:⁸

REASONS FOR JUDGMENT⁹....

- [1] This is an action heard in Saskatoon...pursuant to the Patent Act^{10, 11, 12, 13}...for alleged infringement of the plaintiffs' Canadian Letters Patent No. 1,313,830...the defendants using, reproducing and creating genes, cells and canola seeds and plants containing genes and cells claimed in the plaintiffs' patent, and by selling the canola seed they harvested, all without the consent or licence of the plaintiffs. The commercial product resulting from the plaintiffs' development, from its patent and licensing agreements, is known as "Roundup Ready Canola", a canola seed that is tolerant of glyphosate herbicides including the plaintiffs' "Roundup".
- [2] On consideration of the evidence..., and the submissions...of the parties I conclude that the plaintiffs' action is allowed and some of the remedies they seek should be granted. These reasons set out the bases for my conclusions, in particular my finding that, on the balance of probabilities, the defendants infringed a number of the claims under the plaintiffs' Canadian patent...by planting, in 1998, without leave or licence by the plaintiffs, canola fields with seed saved from

the 1997 crop which seed was known, or ought to have been known by the defendants to be Roundup tolerant and when tested was found to contain the gene and cells claimed under the plaintiffs' patent. By selling the seed harvested in 1998 the defendants further infringed the plaintiffs' patent.

... Indicates one or more paragraphs were not excerpted for this article viz. [3], [10], [12-14], [20-27], etc.

Introduction

- [4] The plaintiff Monsanto Canada Inc...is incorporated under the laws of Canada, and has its principal place of business in Mississauga, Ontario. The plaintiff Monsanto Company...is incorporated under the laws of...Delaware,...and has its principal place of business in St. Louis, Missouri...
- [5] On February 23, 1993, Monsanto U.S. was issued Canadian Letters Patent No. 1,313,830...for an invention termed "Glyphosate-Resistant Plants." The...patent grants Monsanto U.S. the exclusive right, privilege and liberty of making, constructing, using and selling the invention for the full term of the patent. The patent term ends on February 23, 2010. Monsanto Canada is a licensee under the...patent.
- [6] The defendant, Percy Schmeiser... resides near Bruno, Saskatchewan, and...has farmed in that region for more than 50 years. The defendant, Schmeiser Enterprises Ltd., is a corporation organized under the laws of Saskatchewan. It has existed since 1960..., and it was assigned control of his farming business in 1996. The only shareholders and directors of the corporation are Mr. Schmeiser and his wife...
- [7] ...He has grown canola since the 1950's. There, in 1998, the year giving rise to the plaintiffs' claim, his corporation farmed nine fields, in which 1030 acres were devoted exclusively to growing canola. In addition to his farming, Mr. Schmeiser has an extensive history in municipal and provincial politics, and as a businessman and an adventurer.
- [8] The plaintiffs' claim alleges that in 1998 the defendants planted glyphosate-resistant seeds to grow a crop of canola, for harvest, having a gene or cell that is the subject of the plaintiffs' patent. By so doing the defendants are said to use, reproduce and create genes, cells, plants and seeds containing the genes and cells claimed in the plaintiffs' patent. The parties agree that the defendants did not at any time sign a Technology Use Agreement..., the plaintiffs' form of license for growers of the seed containing the patented gene.

- [9] This action, initiated on August 6, 1998, by amended Statement of Claim, dated August 27, 1999, seeks the following relief^{14, 15}:
- (a) An injunction...
 - (b) Delivery up...
 - (c) General...
 - (d) Punitive and exemplary damages;
 - (e) Pre and post judgment interest...
 - (f) ...costs...on a solicitor and client basis...
- ...
- [11] The defendants do not deny the presence of Roundup Ready canola in their fields in 1998, but they urged at trial ..[that they] have ever deliberately planted, or caused to be planted, any seeds licensed by the plaintiffs containing the patented gene. The defendants further asserted that substantial damage and loss has been suffered by them because of the herbicide-resistant plants...that it is not possible to control the growth of the Roundup Ready canola with normal herbicides, it interferes with crop selection, making it difficult to plant anything other than canola, and it requires the adoption of new farming practices. I note that despite this claim no counterclaim by the defendants is before the Court. They do urge that, even if the plaintiffs' patented gene is present in the canola grown by the defendants, that gene must be used, in the sense that the crop must be sprayed with the herbicide Roundup, before any infringement of the patent can be found.
- ...¹⁶

The plaintiffs' patent and its licensing

- [15] The patent in issue, entitled "Glyphosate-Resistant Plants", concerns man-made genetically-engineered genes, and cells containing those genes which, when inserted in plants, in this case canola, make those plants resistant to glyphosate herbicides such as Monsanto's...Roundup. Glyphosate herbicides inhibit the enzyme known as EPSPS, required to produce a particular amino acid essential for the growth and survival of a very broad range of plants. The herbicide so inhibits the enzyme EPSPS that most plants sprayed with Roundup or other glyphosates do not survive.
- [16] scientists of Monsanto U.S. created a genetic insert, known as RT, which, when introduced into the DNA of canola cells by a transformation vector, produces a variety of canola with a high level of tolerance to glyphosate. Once the modified gene is inserted in the DNA..., the plant, its stem, leaves, seeds, etc., contain the modified gene. The plant's progeny, growing from

seed with the patented gene and cells, will largely be comprised of cells with the modified gene. Thus the offspring or seeds of Roundup Ready canola, which is mainly self-germinating, contain the modified gene so that they too are glyphosate-tolerant.

- [17] Glyphosate herbicides such as Roundup have been widely used in Canada for many years. Canola tolerant to glyphosate first became available commercially in Canada in 1996. It has been marketed under licensing arrangements through Monsanto Canada under Monsanto's trade-mark Roundup Ready Canola. In 1996 approximately 600 farmers in Canada planted Roundup Ready canola, on some 50,000 acres. By 2000, approximately 4.5 to 5 million acres of Roundup Ready canola were planted in Canada, by about 20,000 farmers, producing nearly 40% of canola grown in Canada.
- [18] Canola growing in western Canada is a great Canadian success story.^{17, 18} Rape seed was grown on a relatively small scale for many years. Now with the development, largely by Canadian scientists, of high yield seed, now called canola, crops for oil for human consumption and meal for animal feed, provide the greatest annual value of all grain crops in Canada.
- [19] The advantage of Roundup Ready canola is that it is tolerant to the glyphosate herbicide Roundup which can be sprayed after the desired crop has emerged, killing other plants. This procedure is said to avoid any need to delay seeding for early weed spraying, to avoid the use of other special types of herbicides, and to eliminate the need for extensive tillage of the land, thus preserving moisture in the ground.
- ...
- [28] All of the plaintiffs' licensing arrangements in Canada are made by or on behalf of Monsanto Canada. It licenses commercial seed growers to grow Roundup Ready canola for seed purposes. Farmers are required to attend a Grower Enrollment Meeting conducted by Monsanto representatives who describe the gene technology and the licensing terms for its use. A grower must be certified to use the gene technology by signing a Roundup Ready grower agreement. This entitles a farmer to purchase Roundup Ready canola seed from an authorized Monsanto agent, but to acquire seed the farmer must also sign a Technology Use Agreement provided by the retail seed agent acting for Monsanto Canada. Under the latter agreement, the farmer can use the seed for planting only one crop, to be sold for consumption to a commercial

continued on next page

purchaser authorized by Monsanto. The farmer undertakes not to sell or¹⁹ give seed to any other third party and not to save seed for his own replanting or inventory. Under the TUA Monsanto has the right to inspect the fields of the contracting farmer and to take samples to verify compliance with the agreement.

Mr. Schmeiser's farming practices

- [29] As is apparently common practice for a number of canola farmers in the Bruno area, Mr. Schmeiser routinely saved a portion of the canola harvested on his property to serve as seed for the next generation of crops. Through this procedure, Mr. Schmeiser was able to avoid purchasing canola seed after 1993, until 1999, and over the years he believes he was able to develop his own strain of canola that was relatively resistant to various forms of diseases that tend to attack canola.
- [30] It is the defendants' usual practice to grow a conventional variety of canola known as Argentine canola. They also grow wheat and peas, and in addition portions of his land are subject to summer fallow from time to time. For a number of years, Mr. Schmeiser has chosen to grow canola crops back-to-back in the same fields for a period of up to four years. At trial, he asserted that the advantage to such a farming practice is that one may then utilize the benefits of the fertilizer applied the year before, thereby using less and often creating a greater crop yield in the subsequent years. It is also the general practice of Mr. Schmeiser to time the cultivation of his land so as to avoid tilling potentially diseased plant remains into the soil and thereby reducing the possibility of certain diseases developing in new crops. Through this practice over the long-term the defendants say Mr. Schmeiser has been able to grow canola crops that are relatively free of weeds and the common diseases of blackleg and sclerotinia that plague canola. He claims his crops have been better-than-average yields in the Bruno, Saskatchewan area.
- [31] Mr. Schmeiser testified that it is his general practice to use chemical herbicides as little as possible. However, he does use them when necessary for weed control... Mr. Schmeiser also testified that he has used Roundup, particularly to burn off his fields before planting, or to "chem fallow" fields, and also for spraying for weeds and volunteer plants around power poles and in road ditches. He does not like to use it on a growing canola crop. He finds that when sprayed on a growing crop it leaves a residue that kills a substantial amount of bacteria in the soil which affects the yield from back-to-back planting and

increases the possibility of root diseases, such as blackleg and sclerotinia, in canola.

...

- [33] In the 1996 crop year, from which Mr. Schmeiser's 1998 seed was said to be derived through the 1997 crop, there were five other growers with farms in the Rural Municipality of Bayne No. 371 who grew Roundup Ready canola. It is the evidence of Aaron Mitchell, Biotechnology Manager, Research Development Department of Monsanto, at Saskatoon, that of the farms licensed to grown Roundup Ready canola in 1996 the closest field to the defendants' field number 2, from which seed was saved in 1997, was approximately five miles.
- [34] I note that in 1996 one of the licensed farmers, Mr. Huber, a neighbor of Mr. Schmeiser, grew seed under license from Monsanto on a quarter section just north and west of, and diagonally adjacent to, Mr. Schmeiser's field No. 6. It was the evidence at trial of Mr. Schmeiser's hired man, Carlyle Moritz, that at the end of the 1996 crop year, a substantial swath of canola had blown from Mr. Huber's land onto field No. 6. There was no evidence that seed from Schmeiser's field No. 6 was saved in 1996 to be used as seed for his 1997 crop.
- [35] The evidence of Mr. Mitchell for Monsanto is that after both the 1996 and 1997 crop years, the crop was collected from licensed growers by commercial truckers who delivered all of the canola to crushing plants in trucks with tight tarpaulins...

...²⁰

The issues

- [60] The issues arising in this action concern
- the admissibility of evidence of the tests conducted on samples of Schmeiser's canola,
 - the validity of the plaintiffs' patent,
 - possible waiver of patent rights by the plaintiffs,
 - infringement of the patent,
 - the remedies applicable if there be infringement,
 - costs.
- [61] These issues are dealt with in turn, except costs, on which both parties requested opportunity to make submissions following filing of these Reasons.

...

Validity of the plaintiffs' patent

- [77] The defendants question the validity of the plaintiffs' patent on the ground that the subject matter of the patent is not patentable. Further, it is urged that the

enactment of the Plant Breeders' Rights Act,^{21, 22}...is a clear indication of Parliament's intent "that intellectual property rights pertaining to new plant varieties are to be governed by legislation other than the Patent Act and only to the extent permitted under the former Act". The PBRA preserves the right of a farmer to save and reuse seed. Monsanto does not deny that it seeks protection under the²³ Patent Act for its intellectual property rights, to promote its commercial interests, including its interest to preclude by licensing agreements the saving of seed for use by farmers licensed to grow Roundup Ready canola.

[78] Finally, the defendants say that the gene Monsanto claims protection for has been inserted in many different registered varieties of canola and each canola plant is potentially different from others. At least within a particular variety those plants with the gene cannot be distinguished visually from those without, unless both are sprayed with Roundup herbicide. Moreover, the replication of the gene is not caused by human intervention but by natural means and it cannot be contained or controlled. For these reasons it is urged it is not the proper subject matter of a patent, and the patent should be declared invalid.

...

[80] The PBRA was intended to create a new form of intellectual property right in new plant varieties, as defined, for registered plant breeders. These are more limited in scope than the rights of a registered patent holder, but they apply to new registered varieties of plants resulting from breeding, even if the result or the process giving rise to the result is not patentable. Nothing in the PBRA precludes an inventor from seeking registration under the Patent Act. In 1989 proceedings of the Parliamentary Committee considering Bill C-15 (which became the PBRA), the Minister of Agriculture of the day commented...Bill C-15, will enable plant breeders to collect reasonable royalties for their varieties, thus encouraging greater private and public-sector investment...Bill C-15...provides for certain rights for plant breeders and outlines their application, and further details restrictions that will apply to these rights to better protect the public interest. The legislation is designed to deal with the complexities of the issue and that is why we have chosen this route rather than to amend the Patent Act...this is not patent legislation. This is plant breeders' rights... The patent legislation will be more encompassing than what is outlined here...

[81] In my opinion the PBRA was not intended to, and by its terms it does not, preclude registration under the

Patent Act of inventions that relate to plants, and that may lead to new varieties or characteristics of plants. The plaintiffs point to a similar issue raised under United States' statutes of the same general nature which was resolved in an analogous manner...Pioneer Hi-Bred International Inc. v. J.E.M. Ag Supply Inc.²⁴...

[82] The fact that the plaintiffs may have inserted the patented gene in a number of varieties of canola, each of which is different from the others, in my opinion, does not render the subject matter of the patent an improper subject for a patent. The patent is not granted in relation to any claim for a particular variety of canola, or indeed for canola plants exclusively. The subject matter is thus probably inappropriate, it seems to me, for registration under the PBRA, but not inappropriate for registration under the Patent Act.

[83] Moreover, the fact that replication of the gene may occur in the natural course of events, without human intervention after insertion of the gene in the original plant cells, and plants, produced for seed, and that this may result in differences between individual canola plants does not in itself preclude registration, under the Patent Act, of the invention, that is, creation of the gene and the process for inserting the gene...

[84] In this case the Patent Office issued a patent to Monsanto US as owner of the patent..."valid in the absence of any evidence to the contrary" (...s. 45).

[85] The grant of the patent is consistent with the implications of the decision of Mr. Justice Lamer, as he then was, for the Supreme Court of Canada in Pioneer Hi-Bred (supra, para. 79). In that case he dismissed an appeal from a decision of the Federal Court of Appeal that a new variety of soybean produced by cross-breeding (hybridization) was not patentable under the Patent Act. He found that the description of the plant was insufficient to qualify under that Act...he distinguished between a product resulting from hybridization and a product resulting from a process for change in genetic material caused by human intervention within a gene. As I read his decision Lamer J. was careful to restrict his comments to the facts of the case, a product resulting from hybridization. The processes of genetic engineering, properly described, were not excluded from patent protection by implication of that decision.

[86] In *President and Fellows of Harvard College v. Canada (Commissioner of Patents)*...²⁵, Mr. Justice Nadon dismissed an appeal from a decision of the Commissioner of Patents denying an application for a patent for a transgenic mouse, which contained a

continued on next page

gene artificially introduced into the chromosomes of the mammal at the embryonic stage. That decision was reversed by a majority decision of the Court of Appeal...²⁶. Mr. Justice Rothstein for the majority... found that the Patent Act provides, in broad terms, arrangements intended to promote invention and its definition of invention, by s. 2..., as...any new and useful art, process, machine, manufacture or composition of matter, or any new and useful improvement..., is sufficiently broad to include the oncomouse here claimed as patentable. The Act did not exclude a patent, in an appropriate case, for a higher life form that was not human.

- [87] The Harvard Mouse case is not of direct use in resolution of the matter before the Court. There the issue concerned patentability under the Act of a mammal, a higher life form, the oncomouse resulting from reproduction of mice, one of whom bears the gene introduced by invention to affect its susceptibility to cancerous growth...
- [88] It is essentially matters similar to those recognized by the patent granted originally to the applicant for the patent of the mouse that are the subjects of the claims patented in this case. Here it is the gene and the process for its insertion which can be reproduced and controlled by the inventor, and the cell derived from that process, that is the subject of the invention²⁷. The decision of the Trial Judge and of the Court of Appeal in the Harvard Mouse case implicitly support the grant of the patent to Monsanto.
- [89] The patent granted in this case would not appear to be revolutionary in recognizing, by the Patent Office, that certain life forms may be patentable. (See *Re Application of Abitibi Co.*²⁸..., which determined that a yeast culture used to digest spent sulfite liquor, a waste product of pulp mills, was patentable subject matter. See also, *Re Application for Patent of Connaught Laboratories*²⁹..., which found a new bovine cell line patentable).
- [90] I sum up my conclusions...I am not persuaded on any of the grounds urged that the patent in issue is invalid. In the absence of evidence or persuasive argument to the contrary, the patent by virtue of s. 43 of the Patent Act is valid and, as s. 45 provides, it "avails the grantee", Monsanto US, and its licensee, Monsanto Canada, for the term provided in the patent...17 years...to February 23, 2010. By s. 42...the patentee has "the exclusive right, privilege and liberty of making, constructing and using the invention and selling it to others to be used..." for the term of the patent.

Loss or waiver of the plaintiffs' patent rights

- [91] For the defendants it is urged Monsanto has no property interest in its gene, only intellectual property rights. While I acknowledge that the seed or plant containing the plaintiffs' patented gene and cell may be owned in a legal sense by the farmer who has acquired the seed or plant, that "owner's" interest in the seed or plant is subject to the plaintiffs' patent rights, including the exclusive right to use or sell its gene or cell, and they alone may license others to use the invention.
- [92] Thus a farmer whose field contains seed or plants originating from seed spilled into them, or blown as seed, in swaths from a neighbor's land or even growing from germination by pollen carried into his field from elsewhere by insects, birds, or by the wind, may own the seed or plants on his land even if he did not set about to plant them. He does not, however, own the right to the use of the patented gene, or of the seed or plant containing the patented gene or cell.
- [93] I do not agree that the situation is comparable to the "stray bull" cases that recognize that the progeny of stray bulls impregnating cows of another belong to that other... Further, the circumstances here are not akin to those cases that the defendants urge are part of the larger law of admixture, where property of A introduced by A without B's intervention to similar property of B from which it is indistinguishable, becomes the property of B. Monsanto does have ownership in its patented gene and cell and pursuant to the Act it has the exclusive use of its invention. That is an important factor which distinguishes this case from the others on which the defendants rely.
- [94] Here the defendants urge that having introduced its invention for unconfined release into the environment without control over its dispersion, the plaintiffs, as inventor and licensee have lost any claim to enforcement of their rights to exclusive use...
- [95] On the basis of the evidence of pictures adduced by Mr. Schmeiser, of stray plants and of plants in fields, in Bruno and its environs, it is urged that unconfined release and lack of control of Monsanto over the replication of the plants containing their patented gene clearly demonstrates extensive uncontrolled release of the plaintiffs' invention. Indeed it is urged this is so extensive that the spread of the invention cannot be controlled and Monsanto cannot claim the exclusive right to possess and use the invention. It is further urged that it was the plaintiffs' obligation to control its technology to ensure it did not spread and

that Monsanto has not attempted to do so.

[96] That assessment places much weight on photographs of stray plants in Bruno, said to have survived spraying with Roundup, in addition to photographs of canola in fields which is said to be of canola, some with the potential gene incorporated. With respect, the conclusion the defendants urge would ignore the evidence of the licensing arrangements developed by Monsanto in a thorough and determined manner to limit the spread of the gene. Those arrangements require agreement of growers not to sell the product derived from seed provided under a TUA except to authorized dealers, not to give it away and not to keep it for their own use even for reseeding. It ignores evidence of the plaintiffs' efforts to monitor the authorized growers, and any who might be considered to be growing the product without authorization. It ignores the determined efforts to sample and test the crops of the defendants who were believed to be growing Roundup Ready canola without authorization. It ignores also the evidence of Monsanto's efforts to remove plants from fields of other farmers who complained of undesired spread of Roundup Ready canola to their fields.

[97] Indeed the weight of evidence in this case supports the conclusion that the plaintiffs undertook a variety of measures designed to control the unwanted spread of canola containing their patented gene and cell.

[98] I am not persuaded that the plaintiffs have lost the right to claim exclusive use of their invention, or that they have waived any such claim. There clearly is no expressed waiver, and none can be implied from the conduct of the plaintiffs so far as that is a matter of record before the Court.

...

[100] In my opinion the conduct of the plaintiffs does not support a conclusion that it has lost or waived its exclusive rights arising by statute as a result of the grant of its patent.

Infringement of the patent

[101] The plaintiffs claim that the defendants infringed Monsanto's...patent by growing, in 1998, seed that Mr. Schmeiser knew was from his 1997 crop and was from plants that were Roundup resistant. By so doing the defendants reproduced the patented gene and cells. The canola crop so grown in 1998 was harvested and sold by the defendants.

[102] The evidence of Mr. Schmeiser is that seed for his 1998 crop was saved from seed harvested in 1997 in field number 2 by his hired man Mr. Moritz. That

seed was placed by Mr. Moritz in the old Ford truck, then located in field number 2, directly from the combine after it was harvested from the area of that field previously sprayed with Roundup by Mr. Schmeiser. That "testing" by him resulted, by his estimate, supported by Mr. Moritz, of about 60% of the sprayed canola plants surviving in the "good three acres" that he sprayed. The surviving plants were Roundup resistant and their seed constituted the source of seed stored in the old Ford truck.

[103] Knowledge of the nature of that seed by Moritz, the hired hand, is attributable to Mr. Schmeiser and to the corporate defendant. Mr. Schmeiser must be presumed to know the nature of the seed stored in the truck by Mr. Moritz who acted under Schmeiser's general instructions in harvesting the crop.

[104] In spring 1998 the seed from the old Ford truck was treated by HFM, then mixed with bin run seed and fertilizer and used to seed the whole of 1,030 acres of canola grown by Schmeiser in nine fields in 1998.

[105] A variety of tests were conducted on samples of canola from the defendants' field or from beside those fields...

...

[114] ...Despite questions raised about particular aspects of the sampling and the handling of samples of the defendants' 1998 canola crop, subject to consideration of any defence raised, the balance of probabilities supports a conclusion that the growing and sale of Roundup tolerant canola by the defendants infringed the exclusive rights of the plaintiffs to use the patented gene and cell. I reach that tentative conclusion having also concluded on a balance of probabilities that the samples taken from the borders of nine fields in July 1998 and three samples taken at random from within each field in August 1998 are representative of the entire crop, bearing in mind that all of the nine fields were planted with seed that was saved in 1997 in field number 2, which seed was known to be Roundup tolerant.

[115] I turn to submissions of the defendants in reply to the claim for infringement. First, the defendants urge that there was no intention to infringe the patent. However, it is well settled that infringement is any act which interferes with the full enjoyment of the monopoly rights of the patentee as Mr. Justice Rothstein notes in *Lishman v. Erom Roche Inc.*³⁰... Further, intention is immaterial, for "infringement occurs when the essence of an invention is taken",

continued on next page

regardless of the intention of the infringer. (See *Computalog Ltd. v. Comtech Logging Ltd.*³¹...)

[116]...it was urged by defendants that the source of contamination by Roundup resistant canola of their 1996 crop, from which seed was saved for 1997, was uncertain. Indeed so was the source of contamination in the 1997 crop.

[117]A variety of possible sources were suggested, including cross field breeding by wind or insects, seed blown from passing trucks, or dropping from farm equipment, or swaths blown from neighbors' fields. All of these sources, it is urged, could be potential contributors to cross-breeding of Schmeiser's own canola or to deposit of seeds on his land without his consent. Mr. Borstmayer, who farmed on the same grid road but further north from Bruno than Mr. Schmeiser's fields numbers 1, 2, 3 and 4, testified that in the winter of 1996-97 a bag of Roundup Ready canola seed had fallen from his truck in Bruno and broken open, and some seed was lost before he put the broken bag back on his truck to be hauled past Schmeiser's fields to his own. Further, after harvesting his 1997 crop he trucked it to the elevator...past Schmeiser's fields, with at least two loads in an old truck with a loose tarp. He believes that on those journeys he lost some seed.

[118]It may be that some Roundup Ready seed was carried to Mr. Schmeiser's field without his knowledge. Some such seed might have survived the winter to germinate in the spring of 1998. However, I am persuaded by evidence of Dr. Keith Downey, an expert witness appearing for the plaintiffs, that none of the suggested sources could reasonably explain the concentration or extent of Roundup Ready canola of a commercial quality evident from the results of tests on Schmeiser's crop. His view was supported in part by evidence of Dr. Barry Hertz, a mechanical engineer, whose evidence scientifically demonstrated the limited distance that canola seed blown from trucks in the road way could be expected to spread. I am persuaded on the basis of Dr. Downey's evidence that on a balance of probabilities none of the suggested possible sources of contamination of Schmeiser's crop was the basis for the substantial level of Roundup Ready canola growing in field number 2 in 1997.

[119]...In 1997 [Mr. Schmeiser]...was aware that the crop in field number 2 showed a very high level of tolerance to Roundup herbicide and seed from that field was harvested, and retained for seed for 1998.

[120]I find that in 1998 Mr. Schmeiser planted canola seed

saved from his 1997 crop in his field number 2 which seed he knew or ought to have known was Roundup tolerant, and that seed was the primary source for seeding and for the defendants' crops in all nine fields of canola in 1998.

[121]The principal defence raised...is that they did not use the patent because they did not spray their 1998 canola crop with Roundup...they did not make use of the invention as the inventor intended and so, did not use the patented gene or cell.

[122]It is accepted, as the defendants urge, that the claims of a patent are to be construed purposefully. That does not mean that the utility of a patent defines or confines its purpose or its possible uses. It is the taking of the essence of the invention without leave or licence of the owner that constitutes infringement. Here the essence of the claims at issue in this case concerns the patented gene invented by Monsanto and the patented plant cells in which the gene may be found. The claims make no specific direction for or reliance upon the use, after germination of the plant containing the patented gene, of Roundup or other glyphosate herbicide as a part of the invention. The invention does improve glyphosate resistance of the plant that includes the patented gene and the cell, but that characteristic is unaffected by use or lack of use of glyphosate herbicides upon the plant once the seed germinates and the plant begins to grow.

[123]Here the defendants grew canola in 1998 in nine fields, from seed saved from their 1997 crop, which seed Mr. Schmeiser knew or can be taken to have known was Roundup tolerant³². That seed was grown and ultimately the crop was harvested and sold. In my opinion, whether or not that crop was sprayed with Roundup during its growing period is not important. Growth of the seed, reproducing the patented gene and cell, and sale of the harvested crop constitutes taking the essence of the plaintiffs' invention, using it, without permission. In so doing the defendants infringed upon the patent interests of the plaintiffs.

[124]For the defendants it is urged that a finding of infringement will adversely affect the longstanding right of a farmer to save his own seed for use for another crop. In particular it is urged that those who do not purchase Roundup Ready canola seed but find the plant invading their land would be precluded from saving their own seed for use another year since their crop may be contaminated without action by the

farmer on whose land plants containing the patented gene are found.

[125] That clearly is not Mr. Schmeiser's case in relation to his 1998 crop. I have found that he seeded that crop from seed saved in 1997 which he knew or ought to have known was Roundup tolerant, and samples of plants from that seed were found to contain the plaintiffs' patented claims for genes and cells. His infringement arises not simply from occasional or limited contamination of his Roundup susceptible canola by plants that are Roundup resistant. He planted his crop for 1998 with seed that he knew or ought to have known was Roundup tolerant.

[126] Other farmers who found volunteer Roundup tolerant plants in their fields, two of whom testified at trial, called Monsanto and the undesired plants were thereafter removed by Monsanto at its expense.

[127] In the result, I find on a balance of probabilities, and taking into account the evidence of Ms. Dixon about the results of genetic testing of the samples of the defendants' 1998 canola crop, that by growing seed known to be Roundup tolerant and selling the harvested seed, the defendants made use of the invention without permission of the plaintiffs and infringed claims...under the patent.

Remedies for infringement

[128] The plaintiffs claim the following relief for the infringement by the defendants...

A declaration of validity of the patent

[129] ...the plaintiffs...also requested that to the extent the Statement of Defence can be construed to raise an attack on the validity of the patent, the Court should ...affirm the validity of the claims in issue...the Court is prepared to issue such a declaration without foreclosing any possible claim on grounds not here considered, that the patent is invalid.

An injunction

...

[131] In my opinion, the plaintiffs are entitled to an injunction restraining action of the sort here found to constitute infringement...the defendants are enjoined from planting seed retained from their 1997 or 1998 canola crops, or any seed saved from plants which are known or ought to be known to be Roundup tolerant, and from selling or otherwise depriving the plaintiffs of their exclusive right to use plants which the defendants know or ought to know are Roundup tolerant, or using the seeds from such plants.

An Order for delivery up

[132] The plaintiffs are also entitled to an order for delivery up of any plants or seeds...known, or which ought to be known, by the defendants to be Roundup tolerant.

Damages or an accounting of profits

[133] ...the plaintiffs by their Amended Statement of Claim seek relief in the form of general damages or an accounting of profits...In closing argument at trial counsel requested relief for Monsanto US in the form of profits earned by defendants from their 1998 canola crop, said by plaintiffs to be \$105,000...and for Monsanto Canada general damages in the amount of \$15,450...equivalent to \$15...per acre for the defendants' 1998 canola crop, the price in that year for use of the patented technology under a TUA. If both are not possible the plaintiffs together claim, in the alternative, profits of \$105,000...

...

[137] In this case I decline to exercise my discretion to order an accounting of profits in the amount requested by the plaintiffs...

...³³

[141] The plaintiffs also claim exemplary damages. In my opinion this is not a case for exemplary damage...

...³⁴

[145] I am not persuaded that Mr. Schmeiser's conduct, though deliberate and however uncooperative it appeared to the plaintiffs, was such that personal liability in regard to damages or interest is here warranted...Judgment for damages or recovery of profits will be awarded against Schmeiser Enterprises only.³⁵

Conclusions

[146] I find on a balance of probabilities that the growing by the defendants in 1998 of canola on nine fields, from seed saved in 1997 which was known or ought to have been known by them to be Roundup tolerant, and the harvesting and sale of that canola crop, infringed upon the plaintiffs' exclusive rights under Canadian patent...830 in particular claims 1, 2, 5, 6, 22, 23, 27, 28 and 45 of the patent.

[147] The plaintiffs' action for infringement is allowed and will be confirmed by Judgment to be filed after opportunity for counsel to consult...³⁶

[148] ...The plaintiffs are entitled to costs, but the Court will consider any submissions on costs, by either party...

[149] Counsel for the plaintiffs is directed to prepare a draft judgment...to circulate...to counsel for defendants for

continued on next page

comment...If the terms so proposed are not agreed upon...Court would consider written submissions or would hear counsel, if necessary by telephone, on the terms of Judgment.

**Notes:**

1. Federal Court of Canada
Date: March 29, 2001
Docket: T-1593-98
Neutral Citation: 2001 FCT 256
BETWEEN: MONSANTO CANADA INC. and MONSANTO COMPANY, Plaintiffs and PERCY SCHMEISER and SCHMEISER ENTERPRISES LTD., Defendants – MacKay J.
Excerpted from the "...convenience of reference only..." publication on the Federal Court of Canada Internet site <http://www.fct-cf.gc.ca/>; see "Disclaimer" and "Copyright" at http://www.fct-cf.gc.ca/index_e.html
2. <http://www.fct-cf.gc.ca/bulletins/whatsnew/T1593-98.pdf>
3. Percy Schmeiser, Bruno, Saskatchewan – "Monsanto vs Schmeiser/ The Classic David vs Goliath Struggle..." <http://www.percyschmeiser.com>
4. <http://www.biotechknowledge.com/showlib.php3?uid=4868&country>
5. see note above.
6. first book of Samuel, Chapter 17.
7. The comments and footnotes above are by M. Grossman.
8. The excerpts below are edited by M. Grossman; who is also responsible for adding the notes. No notes appeared in the original case text
9. W. Andrew MacKay, JUDGE, Ottawa, 29 March 2001.
10. R.S.C. 1985, c. P-4
11. <http://laws.justice.gc.ca/en/P-4/index.html>
12. <http://laws.justice.gc.ca/en/P-4/text.html>
13. <http://laws.justice.gc.ca/en/>
14. [at page 5 in the original text.]
15. [see [128] et seq.]
16. [page 8.]
17. <http://www.canolainfo.org/scdc/index.html>
18. <http://www.canolainfo.org/scdc/html/facts.html>
<http://www.canolainfo.org/scdc/html/facts.htm>
19. [page: 14.]
20. [page: 27.]
21. Statutes of Canada. 1990, c.20
22. <http://laws.justice.gc.ca/en/P-14.6/82075.html>
23. [page 35.]
24. (2000), 53 USPQ (2d) 1440 (U.S.C.A., Fed.Crt.)
25. [1998] 3 F.C. 510 (F.C.T.D.)
26. [2000] 4 F.C. 528 (F.C.A.)
27. [page 40.]
28. (1982), 62 C.P.R. (2d) 81 (Com'r Pat)
29. (1982), 82 C.P.R. (2d) 32 (Com'r Pat)
30. (1996), 68 C.P.R. (3d) 72 at 77 (F.C.T.D.)
31. (1992), 44 C.P.R. (3d) 77 at 88 (F.C.A.)
32. [page 53.]
33. [page 59.]
34. [page 59.]
35. [page 61.]
36. [page 62.]

Internet Miscellany

- <http://water.usgs.gov/wid/html/chesbay.html>
U.S. Geological Survey – Chesapeake Bay: Measuring Pollution Reduction
- <http://www.usgs.gov/>
- <http://www.dmdtws.er.usgs.gov/>
- <http://wri.nmsu.edu/niwr/>
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- <http://www.cwra.org/>
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- <http://www.cciw.ca/nwri/nwri.html>
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- <http://www.rsc.ca/foodbiotechnology/GMreportEN.pdf>
Elements of Precaution: Recommendations for the Regulation of Food Biotechnology in Canada/An Expert Panel Report on the Future of Food Biotechnology, prepared by The Royal Society of Canada at the request of Health Canada, Canadian Food Inspection Agency and Environment Canada; Ottawa, Ontario, January 2001; ISBN 0-920064-71-x.
- <http://www.rsc.ca>
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- <http://www.cela.ca/>
Canadian Environmental law Association, Toronto.
- <http://www.epa.gov/airmarkets/fednox/fnbtp-fact.pdf>
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- <http://www.access.gpo.gov/nara/nara001.html>
United States Government Manual
- <http://www.access.gpo.gov/nara/cfr/index.html>
Code of Federal Regulations.
- http://www.access.gpo.gov/su_docs/aces/aces140.html
Federal Register
- <http://www.ncbi.nlm.nih.gov/PubMed/>
PubMed – National Library of Medicine - citations from MEDLINE.
- www.teachscience.org/demo/fulltext/bradley.html
- <http://www.teachscience.org/demo/fulltext/bradley.html>
RADMASTE Microscience Project – [for education science laboratories] – J.D. Bradley and M. Nakedi, RADMASTE CENTRE, University of the Witwatersrand, Johannesburg, South Africa.
- <http://www.hc-sc.gc.ca/english/archives/>



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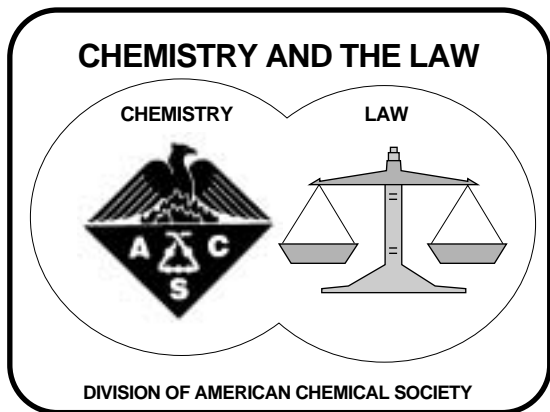
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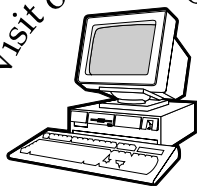
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