# Table of Contents

## Introduction to Card and Identification Technology Workshop

**Larry Linden**

- Introduction to Smart Card Technology and Applications  
  Stephan Seidman, Editor & Publisher, *Smart Card Monthly*.................. 1

- Markets and Applications for Card Technologies  
  Henry Dreifus, President, Dreifus Associates, Ltd............................ 17

- Plastic Card and Identification Card Manufacture  
  Richard McMahon, Managing Director, McMahon & McMahon P.A............. 29

- Chip Card Standards  
  Andrew Tarbox, Vice President, Chip Card Technologies, MasterCard International................................................................. 35

- An Integrator's Perspective on Implementing Card Systems  
  Luke Weinstein, Vice President, Product Technologies Inc............... 53

## Advanced Card Technology Workshop

**Chris Stanford**

- Building the Better Card: An In-Depth Look at the Issues Surrounding Smart Card Production  
  Brad Luhrs, Product Manager, Schlumberger Malco.......................... 63

- Attributes of Contactless Cards  
  Julie Krueger, Marketing Manager, Atmel Corporation........................ 85

- The Next Generation of Smart Card Microcontrollers - A Silicon Perspective  
  Daniel Muenchau, Market Development Engineer, Motorola................ 91

- Future Developments of Chip Card Controllers  
  Klaus Hau, Marketing Manager, Siemens Semiconductors.................... 99

- Operating System for Blank Card  
  Thierry Peltier, Researcher, RD2P  
  (Presented by Vincent Cordonnier, Director of Research, RD2P)......... 107

- ODYSSEY: The Innovative Approach to Smart Card Integration into DCE  
  Roger Merckling, Architect, Hewlett-Packard............................... 117

- About Security in Cash Card Systems  
  Michel Ugon, Vice President R & D, CP8 Transac............................. 125
Asymmetric Cryptography without Modular Multiplications
Jacques Patarin, Head of Cryptographic Dept., CP8 Transac..................141

Evaluations of Smart Card Based Security Systems: Is Your Smart Card Really Secure?
Ernst Bovelander, Project Manager, TNO Evaluation Center for Instrumentation & Security Techniques.................................149

High Level Tamper Resistance Using Piezo-Electric Polymers
Robert Dunn, Chief Executive, Insearch Technology Development Group, Insearch Ltd..............................................................155

Advanced Identification Technology Workshop
Joe Sanders

The Development of a Dynamic Signature Verification System by AEA Technology
Andrew Lewcock, Business Development Manager, AEA Technology.................................................................163

Voice Technology Applications in Identification
Walter Tetschner, President, Voice Information Associates..............173

A Real-Time Face Recognition System Using Machine Vision Techniques
Woodward Yang, Associate Professor, Harvard University...............179

Advances in Fingerprint Image Capture
Oscar Pieper, President, Identicator Technology..........................195

Fingerprint Authentication
Jay Stosz, Engineer, & Lisa Alyea, Mathematician, US Department of Defense.................................................................201

The Use of Edge-lit Holograms for Compact Fingerprint Capture
Michael Metz, President, ImEdge Technology, Inc..........................221

Smart Card Technology Seminar
Henry Dreifus

The State of Smart Card Technology
Stephen Seidman, Editor & Publisher, Smart Card Monthly.............229

Overview of IC Card Standards
Michael Hegenbarth, Director, Card Systems and Applications Consulting Division, DETECON GmbH........................................241
Smart Card Operating System
Philip Lee, President, Applied Systems Institute (ASI) ..................263

Personalisation - "Some Food for Thought"
Chris Jarman, Vice President, IC Card Development,
MasterCard International ...................................................... 267

Magnetic Stripe Card Technology Seminar
Stephen Halliday

Magnetic Stripe Card Technology: A Technology Overview
Stephen Halliday, Vice President of Technology, AIM®USA .............279

Magnetic Stripe Cards: Dead or Alive?
Ronald Morris, Examiner of Questioned Documents,
US Secret Service .............................................................. 287

Magnetic Stripe Reliability
Brian James Byrne, Program Manager, Visa USA .......................... 293

Extending Magnetic Stripe Use into the Twenty First Century
Ashok Vaidya, Marketing Director,
Thorn Secure Science International ...................................... 299

Optical Card Technology
William Alsbrooks

Optical Memory Card Workshop
William Alsbrooks, Vice President and General Manager,
Information Spectrum ......................................................... 309

The Defense Logistics Agency (DLA) Automated Manifest System (AMS):
A Status Report - Year 3
Lucy Capaldi, Traffic Management Analyst,
Defense Logistics Agency .................................................. 315

The Optical Memory Health Passport
Robert Sparks, CEO, BioLife Systems ..................................... 327

OMC: A New Option for EBT
Wayne Stultz, Delaware Card-ONE Manager, Delaware Health and
Human Services ................................................................. 335

Optical Memory Card Hardware and Media: Where it Has Been and
Where it is Going
Keith Edwards, Senior Manager, Marketing & Technical Affairs,
Olympus America .............................................................. 347
Radio Frequency ID Technology Seminar
Stuart Evans

RFID Standards: An Overview of Recent Activity
Dan Mullen, Manager, Technical Services, AIM®USA

Is It a Card or a Tag?
Francis Christian, Market Development Engineer, Motorola
Semiconductor

SuperTag: Reading Multiple Devices in a Field Using a Packet Data
Communications Protocol
Peter Hawkes, Assistant Director, British Technology Group Ltd

Biometric Technology Seminar
Bob Carter

Strategies for the Millennium: Biometric Technology Update
Bob Carter, Director, CardWare Ltd

Issues in Integrating Biometrics
Gordon Dechman, President, Fingerprint USA

Update on the US Government's Biometric Consortium
Joe Campbell, Chairman, Biometric Authentication Consortium

INSPASS: The Evolution of an Established Application
Richard Norton, President, Norton & Associates

Pioneering Applications of Biometrics
Bill Perry, Technology Consultant, Technology Innovations Group,
First National Bank of South Africa

EBT and Social Services Applications Seminar
Jack Radzikowski

Uniform Operating Environment
Iana Schmitzer, Senior Project Manager,
Phoenix Planning & Evaluation

EBT and the WYO Card Demonstration
J. Terry Williams, EBT/Smart Card Manager, State of Wyoming,
Office of the Governor
Automated Fingerprint Image Reporting and Match (AFIRM) System
Lisa Nuñez, Chief, Computer Services Division, LA Dept. of Social Services...............................................................473

New York State Department of Social Services: Automated Finger Imaging System
Richard Nawrot, Director, Case Integrity Unit, NY State Dept. of Social Services............................................................481

Information Security Applications Seminar
Mike Baum

The Law and Secure Electronic Commerce
Mike Baum, Principal, Independent Monitoring.........................................................491

Electronic Cash: What it is and What it Means
David Chaum, Managing Director, DigiCash bv .........................................................501

Overview of Smart Card Security and Standards
Gilles Garon, President, Gilles Garon Consultants, Ltd...............................................507

An Advanced Model of Security Description Policy for the Smart Card
Jean-Marie Place, Philippe Roussel, Patrick Trane, RD2P
(Presented by Patrick Trane, Researcher, RD2P)........................................................523

Card Use in Network Security
Alain Sigaud, Researcher, CP8 Transac.................................................................543

Smart Cards and Fraud
Jean-Paul Thomasson, SGS-Thomson Microelectronics...........................................551

Closed Stored Value Applications Seminar
John Stearns

Introduction to Closed Stored Value Card Systems
John Stearns, President, JHS Enterprises and Director, University of Minnesota Card Office..............................................557

Experiences from a Closed On-Line Stored Value Card System
Lowell Adkins, Administrative Manager, DukeCard Office, Duke University..................561

Metro Card: A Migration Path from Closed to Open Systems
Charles R. Broshous, President, MTA Card Company..............................................577
The Electronic Purse in Africa
   Stelios Sardanis, Senior Vice President, Meridien Biao Bank.............589

Religious Implications for the Use of Smart Cards in the Payment System
   Paul F.P. Coenen, President, Electronic Strategy Associates ..............597

Military Applications of Smart Cards 1995-2000
   LTC Greg Ayres, Senior Program Analyst, DoD Health Affairs ............603

*Electronic Purse Applications Seminar*
   Robin Townend

The Case for E-Money and Worldwide Overview
   Robin Townend, Senior Vice President, MasterCard International .....607

E-Money (That's What I Want)
   Steven Levy, Author, Fellow,
   Freedom Forum Media Studies Center........................................623

Countdown to Rollout: The MAC Electronic Purse
   Donald Gleason, President, Smart Card Enterprise/EPS...................643

The Banksys Proton Card
   Armand Linkens, Director of Marketing, Banksys ..........................657

*The World of Phone Cards Seminar*
   Steven Hiscocks

The World of Phone Cards
   Steven Hiscocks, Editor, *International Telephone Card Magazine*......677

US WEST Telecard
   Michael Wautier, Telecard Product Manager, US WEST......................685

The State of Phone Card Collecting in the US
   Roger Streit, President, International Phone Card Exchange............697

Where are Phone Cards Going?
   Peter Harrop, Chairman, Kalamazoo Computer Group plc....................705
Transportation Applications Seminar
Joe Simonetti

The Chicago Transit Authority (CTA) Experience
Joe Simonetti, General Manager, Revenue Equipment, Technology & Maintenance, Chicago Transit Authority ........................................... 719

Emerging Fare Media Technologies
Ashok Joshi, Senior Transportation Engineer, JW Leas & Associates ................................................................. 759

Smart Card Projects in Transit
Floyd Diaz, Vice President, AES Prodata ...................................................... 777

Telecommunications Applications Seminar
Bill Barr

Smart Cards and the NII
Bill Barr, Executive Director, Information Services Marketing, Bellcore ................................................................. 795

Market Forecasts and Industry Trends in Communications
Henry Dreifus, President, Dreifus Associates, Ltd ...................................................... 807

GSM in the USA
Ray Nettleton, President, NettWork Consulting LLC ...................................................... 819

Phone Cards in North America: The Canadian Perspective
Claude Proulx, General Manager, Public Telecommunications, Bell Canada ...................................................... 829

UBI Consortium
Serge Limoges, Executive Director, Nova Consulting Services ...................................................... 841

What's Happening with Screen Phones?
Bob Haddock, President, M•Power Corp ...................................................... 855

Financial Applications Seminar
Jean McKenna

What the Market Research Says
Jeffrey Kutler, Senior Editor, American Banker ...................................................... 863

How Financial Transaction Systems are Changing in America
Catherine Allen, Vice President, Citicorp Technology Office ...................................................... 869
Smart Card Technology - Privacy and Other Legal and Regulatory Challenges
John Burke, Managing Partner, Foley, Hoag & Eliot ...........................................879

Smart Cards in Canada: Not Yet, But...
J. David Livingston, Senior Vice President,
Toronto Dominion Bank ......................................................................................883

**Government Applications Seminar**
**Gary Glickman**

The Growing Role of Cards in Government: Interoperability and Integration
Gary Glickman, President, Phoenix Planning & Evaluation.................................891

MARC: The US's Largest Multi-Application Smart Card Program
Thomas Gregg, President, 3G International .............................................................909

Multi-Application Cards: The Ohio Data Linkage Program
Joseph R. Zimmerman, Assistant Deputy Director, Ohio Dept. of
Administrative Services .......................................................................................915

The Future of Cards in Motor Vehicle Systems: "Change and Uniformity"
Joe Sanders, Director, Office of Customer Services,
New York State Dept. of Motor Vehicles ..........................................................921

Card Enabled Transactions...For Public Access...For Universal Financial
Services...For Personal Privacy
Chuck Chamberlain, Manager, Technology Policy and NII Liaison,
US Postal Service ...............................................................................................935

Social Security Card in Spain
Javier Perez-Garcia, Commercial Director for Cards,
Fabrica National de Moneda y Timbre ...............................................................939

Western Governors' Association Health Passport Project
Bruce Caswell, Manager, Price Waterhouse .....................................................953

**Large-Scale ID Applications Seminar**
**David Snodgrass**

Standards and Uses of the State Driver's License
Duncan Macpherson, Director of Information Services,
New York State Dept. of Motor Vehicles ..........................................................955

Panel: Large Scale ID in Action
Kevin Curry, Marketing Manager, 3M Safety & Security Systems ...............961
Planning & Implementation of the Maryland Driver License System
Paul Luxion, Vice President, Sales and Marketing,
Advantage Technology ................................................................. 973

Thermal Dye Transfer Printing in Large Scale Photo ID Applications
Richard Blackford, Applications Manager, ICI Imagedata ................. 987

Digital Photo Identification Printing: Present and Future Identification
Printer Technologies
Harry Schofield, President, Atlantek, Inc ........................................ 993

Fingerprint Case Study: The Haitians at Guantanamo Bay
Gordon Dechman, President, Fingerprint USA ............................... 1013

Health Care Applications Seminar
Joe Krysztoforski

Issues of Smart Cards as a Portable Database
Bob High, Consultant, RHH Associates Inc./IBM ............................. 1027

Medical Data Cards - Portable Medical Records
Sherman Hope, MD, Medical Director, Patient Medical Records ....... 1035

Quebec Patient Smart Cards: First Results and Findings
Marie-Josée Papillon, Researcher, University of Laval, Dept. of Preventive and Social Medicine .................................................. 1041

The Case for the MEDTAG Device and Field Medical Smart Card Applications
Scott Eyestone, Advanced Program Manager, Battelle ..................... 1053

Dean Clinic: An American Smart Health Card
JoAnn Lehtihet, Vice President, Applied Systems Institute (ASI) ...... 1065

Speaker Biographies ..................................................................... 1073