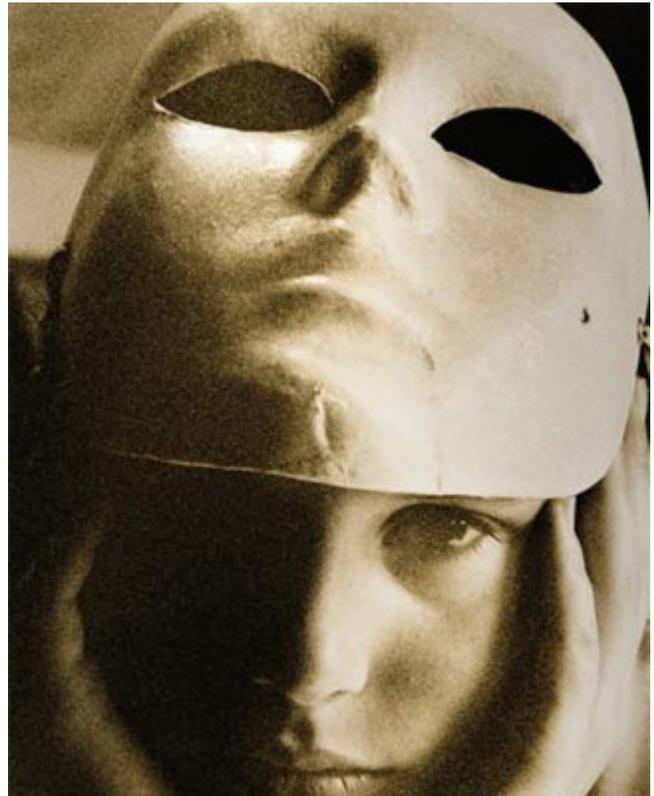# 2012

Centre for Science,
Society and Citizenship

TABULA RASA
Trusted Biometrics
under Spoofing Attacks

SPOOFING AND ANTI-SPOOFING: THE WIDER HUMAN CONTEXT

Rome, May 10-11, 2012

SPOOFING AND ANTI-SPOOFING
the wider human context

High Level Workshop convened within the scope of the research project "Trusted Biometrics under Spoofing Attacks"[1] - TABULA RASA[2]

TABULA RASA is a 42 month project addressing the urgent need to identify, evaluate, and develop countermeasures to direct ("spoofing") attacks on trusted biometric systems. TABULA RASA will:

1. Address the need for a draft set of standards to examine this problem.
2. Propose countermeasures such as combining biometric information from multiple sources.
3. Examine novel biometrics that may be inherently robust to direct attacks.

TABULA RASA is also committed to investigation of the human, social, ethical, legal, and policy implications of systems for counteracting spoofing attacks. The project will therefore identify and investigate the main ethical and legal implications of anti-spoofing techniques. This workshop, attended by experts and leaders in the field, is an integral part of that investigation.

It is by now well known that conventional biometric techniques, such as fingerprinting or face recognition, are vulnerable to "spoofing attacks" (also known as "direct attacks"). In a spoofing attack, the perpetrator attempts to fool a biometric system by presenting to it a fake biometric. A fingerprint system, for instance, may be vulnerable to a spoof attack in which the perpetrator acquires another person's fingerprint (by lifting it from a used glass in a restaurant, say), creates an artificial or "gummy" finger, and presents this to the system's fingerprint scanner. Or again, a facial recognition system may be vulnerable to a spoof attack in which the perpetrator wears a mask in order to impersonate somebody else.

The problem of spoofing attacks affects: organisations (public and private) and the individuals who wish to employ biometric systems for identification and authentication; companies in the high security field; small and medium sized enterprises (SMEs) that wish to market and sell biometric technologies; and, of course, all of us who encounter biometrics in the run of normal life – be it during passport control at the airport, or when using a Smartphone.

Investigation into countermeasures against spoofing attacks is therefore urgently called for – this is TABULA RASA's remit. The project will seek to analyse the vulnerabilities of a range of biometrics to spoofing attacks; to propose and explore countermeasure relying upon multi-modality and liveness-detection; and to examine the advantages and limitations of emerging

biometrics – such as gait (the way one walks) or electro-physiological signals (e.g. heartbeat) – which are thought to be inherently robust to spoofing attacks.

About the Workshop

Biometric technologies raise a number of ethical and legal concerns, as has been well-documented by recent European FP7 projects.[3] Traditional ethical concerns arising from biometrics include:

- Concerns that the use of biometrics is inherently offensive to human dignity, demeaning, dehumanising, threatening to physical or mental integrity, etc.
- Questions as to whether particular uses of biometrics are appropriate (i.e. do potential benefits outweigh risks and demerits?).
- The need to understand the nature of biometric data (is it necessarily: personal, sensitive, private or public, etc.?).
- The role of informed consent: how best to inform subjects that they are being scanned and what data is being taken.
- Concerns regarding privacy and data protection and the inadvertent revealing of sensitive information (regarding e.g. health, emotional state, background, lifestyle, etc.).
- The potential for function creep.
- Potential uses for surveillance and law-enforcement (also concerns regarding profiling, intention-detection, etc.) and use of remote and covert biometrics, as well as continuous authentication.
- Issues of non-discrimination (e.g. "failure-to-enrol" biases).

TABULA RASA is concerned with all these issues, which are only heightened and intensified by the kind of anti-spoofing countermeasures investigated in the project (liveness-detection, multi-modality, inherently robust biometrics). However TABULA RASA also addresses questions that extend the traditional debate – questions such as:

- What further concerns are raised specifically by spoofing and anti-spoofing countermeasures?
- Are there ethical concerns which are raised by spoofing and anti-spoofing countermeasures but not raised by standard biometrics?
- How would it be possible to apply the data minimization principle[4] to anti-spoofing countermeasures?
- To what extent could principles of transparency[5] and proportionality[6] be applied to anti-spoofing countermeasures without jeopardising them?

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[3] BITE, "Biometric Identification Technology Ethics", www.biteproject.org; HIDE, "Homeland Security, Biometric Identification and Personal Detection Ethics", www.hideproject.org; ACTIBIO, "Unobtrusive Authentication using Activity-Related and Soft-Biometrics", www.actibio.eu; RISE, "Rising Pan European and International Awareness of Biometrics and Security Ethics", www.riseproject.org.

[4] The principle of "data minimization" means that a data controller should limit the collection of personal information to what is directly relevant and necessary to accomplish a specified purpose. They should also retain the data only for as long as is necessary to fulfil that purpose (http://www.edps.europa.eu/EDPSWEB/edps/site/mySite/pid/74)

[5] The data subject has the right to be informed when his personal data is being processed.

[6] Personal data may be processed only insofar as it is adequate, relevant and not excessive in relation to the purposes for which they are collected and/or further processed

The TABULA RASA *Workshop* offers a wonderful opportunity to address the central ethical issues raised by biometrics, spoofing, and anti-spoofing countermeasures.

Workshop Format

This two-day workshop is organised around three main round tables

- **Round Table 1: In Biometrics We Trust?**
  This round table is devoted to social challenges related to reliability and trustfulness of biometric technologies. We will focus on societal aspects of reliability and trustfulness, rather than on mere technological aspects. In other words we aim to explore to what extent users and the general public trust in biometrics and to what extent trust and mistrust are related to the robustness and resilience to spoofing attacks.

- **Round Table 2: From Biometric to Augmented Human Recognition**
  This round table is devoted to new and emerging biometrics. We will focus on the novel scenarios opened by biometric innovation and to novel threats and risks, notably as far as spoofing and anti-spoofing are concerned. In this round table we will explore whether new biometrics expose the citizen to new risks but also whether they are creating new opportunities.

- **Round Table 3: The Ethical and Legal Context**
  This round table is devoted to normative and regulative aspects. We will focus on the main ethical and legal challenges raised by current and future spoofing and anti-spoofing with the aim to formulate policy options and to fulfill a prospective role by providing early warnings for emerging ethical, legal, and social issues in this area.

At each round table three speakers will deliver a short lecture . They will be challenged by three commentators, before the floor is opened to roundtable discussion. Interaction and lively debate is expected and encouraged. All participants (speakers, commentators, and audience) are leading experts in the field. On the evening of the first day, a workshop dinner will foster community and encourage free transfer of knowledge. The afternoon of the second day (Friday) will be devoted to three targeted working groups and networking among participants.

Workshop Outcomes

The workshop promotes animated and vigorous discussion of the central ethical and legal issues concerning anti-spoofing measures in biometrics. Roundtable discussion after each speech and response will highlight conflicts and consensus. These will be documented by the Centre for Science, Society and Citizenship, and made available via TABULA RASA's dissemination activities (e.g. via the project website www.tabularasa-euproject.org). All slides and handouts provided by speakers will also be available.

Dates and Venue

10-11 May 2012, NH HOTEL LEONARDO DA VINCI - **ROME**

How to Get There

From Fiumicino Airport: train "Leonardo" to Termini train station – city center
(www.trenitalia.it)
From Ciampino Airport: bus service to Termini train station – city center
(http://www.terravision.eu/rome_ciampino.html)
NH Leonardo da Vinci is located 5 Km from the Termini Station in Rome. You can take the
underground (Line A) and get off at **Lepanto,** which is 5 min walking from the hotel.
Taxi is not reimbursed.

Contacts

Workshop Chair: Emilio Mordini (emilio.mordini@cssc.eu)

Scientific Secretariat: Andrew Rebera (andrew.rebera@cssc.eu)
                    Valeria Balestrieri (valeria.balestrieri@cssc.eu)

Scientific Committee: Alessandro Alessandroni**,** Matteo E. Bonfanti, Patrizio Campisi,
                    Davide Maltoni, Vincenzo Piuri, Fabio Roli, Mario Savastano,
                    Massimo Tistarelli

Host Institution: Centre for Science, Society and Citizenship (www.cssc.eu). Piazza Capo di
                    Ferro, 23 – 00186 Roma – Italy. Telephone: +39 06 45 55 10 42.

Information: tabula.rasa@cssc.eu

Workshop Agenda

THURSDAY, MAY 10, 2012

0815 - 0845   Registration and coffee

OPENING

Chair: **Emilio Mordini,** Centre for Science, Society and Citizenship

0845 - 0900   The scope of the workshop by **Emilio Mordini**

0900 - 0915   Welcome by *Sebastien Marcel*, TABULA RASA Coordinator

0915 - 0930   **Andrew Rebera**, Centre for Science, Society and Citizenship, Introduction and Essential Information

Key notes delivered by

0930 -1010   **Kim Cameron**, Identity and Access Division, Microsoft
                   Identities and Fake Identities

1010 - 1030   *Coffee break*

FIRST ROUND TABLE: IN BIOMETRICS WE TRUST?

Chair: **Jacques Bus**, Secretary General Digital Enlightenment Forum

1030-1110   *The Spirit of Biometrics*
                   James Wayman, San Jose State University

Challenged by: **Mario Savastano**, Department of Electrical Engineering, Federico II University of Napoli

1110 - 1150   *Trust in Identification: an Historian's View*
                   Edward Higgs, University of Essex

Challenged by: **Marcela Espinoza** - School of Criminal Law-Forensic Science Institute, University of Lausanne

1150 – 1230   *The Importance of Robust ID in Development*
                   Alan Gelb, Center for Global Development, former Director of Development Policy at the World Bank

Challenged by: **Peter Went**, CEO of WCC Smart Search and Match

1230 - 13000   **GENERAL DISCUSSION**

1300 – 1400   *Lunch*

SECOND ROUND TABLE: FROM BIOMETRIC TO AUGMENTED HUMAN RECOGNITION

Chair: **Fabio Roli**, Department of Electrical and Electronic Engineering, University of Cagliari

1400 - 1440	*The Future of Identity*
	Joseph J. Atick, Identity & Strategic Advisor to MorphoTrust USA
Challenged by:	**Roberto Tavano**, Unisys, Global Security Sales for Technology, Consulting & Integration Services

1440 - 1520	*Camouflage and the Influence of Fashion on Biometrics*
	Adam Harvey, CV Dazzle Project
Challenged by:	**John Bustard**, School of Electronics and Computer Science, University of Southampton

1520 - 1600	*Moving Beyond Passwords*
	Richard Guidorizzi, Program Manager, Defense Advanced Projects Agency, Information Innovation Office (Cyber)
Challenged by:	**Claire Hardaker**, Department of Linguistics and English Language University of Central Lancashire

1600 - 1630	*Coffee Break*

1630 – 1730	**GENERAL DISCUSSION**

Prompted and moderated by:
Patrizio Campisi, Department of Applied Electronic, University of Rome 3

CONCLUDING SESSION

Chair: **Emilio Mordini,** Centre for Science, Society and Citizenship

1730 - 1800	Biometrics: Privacy by Design in Action (video speech)
	Ann Cavoukian, Ontario Information and Privacy Commissioner
1800	*Adjourn*
2000	*Dinner and networking*

FRIDAY, MAY 11, 2012

0830 - 0900   Late registration and coffee

THIRD ROUND TABLE: THE ETHICAL AND LEGAL CONTEXT

Chair: **Massimo Tistarelli**, Computer Vision Laboratory, University of Sassari

0900 - 0940   *The historical perspective*

Simon Cole, Department of Criminology, Law & Society, University of California, Irvine

Challenged by: **Chang-Tsun Li**, Department of Computer Science, University of Warwick

0940 – 1020   *About deception*

Glen Newey, Political Theory, Université libre de Bruxelles

Challenged by: **Joerg Resch** – KuppingerCole

1020 - 1040   Coffee break

1040 - 1120   *Biometrics, spoofing and the transparency of the future*

Anders Sandberg, Future of Humanity Institute, Oxford University

Challenged by: **Armindo Freitas-Magalhães,** Emotion Psychology, University Fernando Pessoa Health Sciences School, Porto

1120 - 1230   **GENERAL DISCUSSION**

Prompted and moderated by:
Alexander Nouak, Fraunhofer Institute for Computer Graphics Research IGD, and chair of the European Association for Biometrics

CONCLUDING SESSION

Chair: **Alessandro Alessandroni** – DigitPA, Italian Presidency of the Council of Ministers

1230 - 1245   *TABULA RASA: where we are, where we go*
Sebastien Marcel, TABULA RASA Coordinator

1245 - 1300   *ἄνδρα πολύτροπον, ὃς μάλα πολλὰ πλάγχθη*
Emilio Mordini, Centre for Science, Society and Citizenship

1300   *Adjourn*

1300 - 1400   *Lunch*

FRIDAY, MAY 11, 2012 AFTERNOON

WORKING GROUPS AND NETWORKING (PARALLEL)

1400 - 1600	**Ethical and Policy Aspects of Education and Training** Chair: Emilio Mordini
1400 - 1600	**Privacy and Data Protection** Chair: Andrew P. Rebera
1400 - 1600	**Forensic implications** Chair: Chang-Tsun Li
1600 - 1630	*Coffee*
1630	*Adjourn*

REGISTRATION TO FRIDAY AFTERNOON EVENTS

Name	
Institution	

Email		Tel

I would like to participate in the following working group (check the box)

	Education and Training
	Privacy and Data Protection
	Forensic Implications
	I prefer to devote Friday afternoon to networking with other participants

Please fill in this form and return by May 4 to:

Valeria Balestrieri valeria.balestrieri@cssc.eu

Participants

Alessandro Alessandroni – DigitPA, Ente Nazionale per la digitalizzazione della Pubblica Amministrazione, Italian Presidency of the Council of Ministers (IT)

Joseph Atick - L-1 Identity Solutions, International Biometrics & Identification Association (IBIA), (USA)

Valeria Balestrieri – Centre for Science, Society and Citizenship (IT)

Matteo E. Bonfanti - Centre for Science, Society and Citizenship (IT)

Jacques Bus - Secretary General Digital Enlightenment Forum and Centre for Science, Society and Citizenship (NL)

John Bustard – School of Electronics and Computer Science, University of Southampton (UK)

Kim Cameron – Identity and Access Division, Microsoft (USA)

Patrizio Campisi - Department of Applied Electronic, University of Rome 3 (IT)

Ann Cavoukian, Ontario Information and Privacy Commissioner (CA)

Simon Cole – Department of Criminology, Law & Society Cornell University (UK)

Marcela Espinoza - School of Criminal Law-Forensic Science Institute, University of Lausanne (CH)

Armindo Freitas-Magalhães - Facial Emotion Expression Lab (FEELab), University Fernando Pessoa Health Sciences School, Porto (PT)

Alan Gelb - Center for Global Development, former Director of Development Policy at the World Bank

Barry Guihen - Centre for Science, Society and Citizenship (IT)

Richard Guidorizzi - Defense Advanced Projects Agency, Information Innovation Office (Cyber) (USA)

Claire Hardaker – Department of Linguistics and English Language, Lancaster University (UK)

Adam Harvey – CV Dazzle Project (USA)

Edward Higgs –Department of History , University of Essex (UK)

Chang-Tsun Li, - Department of Computer Science, University of Warwick (UK)

Young-Bin Kwon - Deptartment of Computer Eng., Chung-Ang University (KO)

Sebastien Marcel - IDIAP Research Institute (CH)

Emilio Mordini – Centre for Science, Society and Citizenship (IT)

Glen Newey - Université libre de Bruxelles (BE)

Alexander Nouak - Fraunhofer Institute for Computer Graphics Research IGD, and chair of the European Association for Biometrics (Germany)

Gianluca Petrosino – Innovation Scouting & Research, Unicredit (IT)

Andrew P. Rebera – Centre for Science, Society and Citizenship (IT)

Joerg Resch – KuppingerCole (DE)

Fabio Roli – Department of Electrical and Electronic Engineering, University of Cagliari (IT)

Anders Sandberg, Future of Humanity Institute, Oxford University (UK)

Mario Savastano, Department of Electrical Engineering, Federico II University of Napoli (IT)

Massimo Tistarelli – Computer Vision Laboratory, University of Sassari (IT)

Roberto Tavano –Unisys Corporation, Global Security Sales for Technology, Consulting & Integration Services, (IT)

James Wayman – San Jose State University (USA)

Peter Went – WCC Smart Search and Match (NL)

Biographies

Joseph Atick is a recognized biometrics and identity industry veteran, having been involved in the space since its inception more than 20 years ago through a series of companies that he co-founded and led as CEO from the early development phase through validation and commercialization. These include Visionics, Identix, and L-1 Identity Solutions, where in the latter he was the chief strategy officer until the company was sold to Morpho in July 2011. Since then he has acted as an advisor to CEOs and boards in the identity management industry and governments throughout the world working with companies like MorphoTrust on strategic directions and helping nations assess the fitness of their plans for responsible identity programs. Joseph Atick co-founded, in 1998, the International Biometrics and Identification Association (IBIA). He is a highly sought after speaker at industry events and a frequent commentator in the media. He also testifies often before international governmental bodies on issues related to privacy and responsible use of identity technologies. Joseph Atick holds a Ph.D. in Mathematical Physics from Stanford University.

Matteo E. Bonfanti works at the Centre for Science, Society and Citizenship, where his research focuses mainly on international and EU fundamental rights law and policies, the EU internal security relevant framework and strategies, and other security-related issues (intelligence, intelligence-led policing and information warfare). At present he follows two EC projects funded under FP7. SNIFFER concerns border security application of artificial sniffing devices; ETCETERA concerns the evaluation of critical and emerging technologies for the elaboration of a security research agenda in Europe. Before joining CSSC, Matteo was Research Fellow for the European Privacy and Human Rights (EPHR) Project at the Central European University Center for Media and Communication Studies (CMCS) in Budapest. In 2008 he served as research assistant at the office of the European Data Protection Supervisor (EDPS) in Brussels. He was a trainee at the Italian Permanent Mission to the International Organizations in Vienna, where he dealt with international cooperation within UNODC (United Nation Office on Drugs and Crime). Matteo holds a PhD in International Human Rights Law from the Sant'Anna School of Advanced Studies in Pisa (dissertation on "The EU's law enforcement and intelligence cooperation to prevent and to fight terrorism, crime and other transnational threats and its implication on the right to private life and to data protection").

Jacques Bus was born in the Netherlands in 1947, and received his PhD in Science and Mathematics at the University of Amsterdam. He worked as a researcher for 12 years and subsequently as research programme manager for 5 years at the Centre for Mathematics and Computer Science (CWI) in Amsterdam (NL). In 1988 he joined the European Commission and has worked in leading positions in various parts of the Research programmes ESPRIT and IST, including IT Infrastructure, Programme Management, Software Engineering and since 2004 in Trust and Security. He was strongly involved in the establishment of the Security Theme in FP7. Since 2010 he is independent advisor in the area of Trust and Security, with special attention to Privacy, Identity and Trust in the Digital Environment. This includes functions:
- Secretary General of Digital Enlightenment Forum
- Director of Business Development at Privacy & Identity Lab (PI.lab), NL
- Research Fellow at Univ Luxembourg (SnT)
- Senior Advisor CSSC, IT

John Bustard received a B.A. degree in computer science from the University of Cambridge, Cambridge, U.K., in 2000. He completed a Ph.D. in unconstrained ear recognition in 2007 from the School of Electronics and Computer Science, University of Southampton, Southampton, U.K. From 2000–2007, he was in the computer games industry, working on Microsoft Xbox and Sony PlayStation platforms, in areas ranging from the design and pitching of next-generation game concepts to the development of core components of commercial game systems. These included such areas as physics and collision systems, artificial intelligence, graphical effects, user interface development, and character control.

Kim Cameron is a leading expert and consultant on digital identity. Kim is Chief Architect of Identity in the Identity and Access Division at Microsoft, where he champions the emergence of a privacy enhancing Identity Metasystem reaching across technologies, industries, vendors, continents and cultures. Kim played a leading role in the evolution of Active Directory, Federation Services, Forefront Identity Manager, CardSpace and Microsoft's other Identity Metasystem products. He joined Microsoft in 1999 when it bought the ZOOMIT Corporation. As VP of Technology at ZOOMIT, he had pioneered metadirectory technology and built the first shipping product. Before that he led ZOOMIT's development team in producing a range of SMTP, X.400, X.500, and PKI products. In 2009 he was appointed a Microsoft Distinguished Engineer. He grew up in Canada, attending King's College at Dalhousie University and l'Université de Montréal. He served on RISEPTIS, the high-level European Union advisory body providing vision and guidance on security and trust in the Information Society. He has won a number of industry awards, including Digital Identity World's Innovation Award (2005), Network Computing's Top 25 Technology Drivers Award (1996) and MVP (Most Valuable Player) Award (2005), Network World's 50 Most Powerful People in Networking (2005), Microsoft's Trustworthy Computing Privacy Award (2007) and Silicon.com's Agenda Setters 2007. In 2010 King's College recognized his work on digital identity by awarding him an honorary Doctor of Civil Law degree. Kim blogs at identityblog.com, where he published the Laws of Identity.

Patrizio Campisi (www.comlab.uniroma3.it/campisi.htm) is professor at the Department of Applied Electronics, Università degli Studi "Roma Tre", Roma Italy and director of the Biometrics and Multimedia Forensics Lab at the same University. His research interests are in the area of digital signal, image and video processing with applications to forensics and secure multimedia

communications. Specifically, he has been working on secure biometric authentication, digital watermarking, image deconvolution, image analysis, stereo image and video processing, blind equalization of data signals, and secure communications. He is an Associate editor of IEEE Transactions on Information Forensics and Security (Jan. 2012 – Jan. 2014). He is an Associate editor of IEEE Signal Processing Letters (Dec. 2008 – Dec 2012). He is an Associate editor of IET Biometrics (Dec. 2011 – present). He is an elected member of the IEEE Information Forensics and Security Technical Committee (Jan. 2011 - Jan 2013). He is a member of IEEE Certified Biometric Program (CBP) Learning System Committee (2007 - present) and a member of the IEEE Technical Committee on Information Assurance & Intelligent Multimedia- Mobile Communications, system, Man, and Cybernetics Society (2007 - present). He has been involved in several EU projects dealing forensics and biometrics.

Ann Cavoukian is recognized as one of the leading privacy experts in the world. Noted for her seminal work on Privacy Enhancing Technologies (PETs) in 1995, her concept of Privacy by Design seeks to proactively embed privacy into the design specifications of information technology and accountable business practices, thereby achieving the strongest protection possible. In October, 2010, regulators from around the world gathered at the annual assembly of International Data Protection and Privacy Commissioners in Jerusalem, Israel, and unanimously passed a landmark Resolution recognizing Privacy by Design as an essential component of fundamental privacy protection. This was followed by the U.S. Federal Trade Commission's inclusion of Privacy by Design as one of its three recommended practices for protecting online privacy – a major validation of its significance. An avowed believer in the role that technology can play in the protection of privacy, Cavoukian's leadership has seen her office develop a number of tools and procedures to ensure that privacy is strongly protected, not only in Canada, but around the world. She has been involved in numerous international committees focused on privacy, security, technology and business, and endeavours to focus on strengthening consumer confidence and trust in emerging technology applications. Ann Cavoukian serves as the Chair of the Identity, Privacy and Security Institute at the University of Toronto, Canada. She is also a member of several Boards including, the **European Biometrics Forum, Future of Privacy Forum,** RIM Council, and has been conferred a Distinguished Fellow of the Ponemon Institute. Cavoukian was honoured with the prestigious Kristian Beckman Award in 2011 for her pioneering work on Privacy by Design and privacy protection in modern international environments. In the same year, she was also named by Intelligent Utility Magazine as one of the Top 11 Movers and Shakers for the Global Smart Grid industry, received the SC Canada Privacy Professional of the Year Award and was honoured by the University of Alberta Information Access and Protection of Privacy Program for her positive contribution to the field of privacy. Most recently in November 2011, Cavoukian was ranked by
Women of Influence Inc. as one of the top 25 Women of Influence recognizing her contribution to the Canadian and global economy. This award follows her recognition in 2007 by the Women's Executive Network as one of the Top 100 Most Powerful Women in Canada.

Simon A. Cole is Associate Professor & Chair of the Department of Criminology, Law and Society at the University of California, Irvine. He is the author of Suspect Identities: A History of Fingerprinting and Criminal Identification (Harvard University Press, 2001).

Marcela Espinoza obtained her diploma in forensic sciences in 2004 at the School of Criminal

Law / Forensic Science Institute, University of Lausanne. She participated on the ABID project (Applying Biometrics to Identity Documents) financed by the FNRS (Fonds national de la recherche Suisse). This project, carried out in collaboration with the EPFL and the Swiss Institute of Comparative Law, has for objective to study the security, legal and technological implications associated with biometric documents. Her participation on this project concerned the security implications and she studied the following issues: public perception, scenario of use, standards and attacks directed against biometric systems (mainly against the sensor). The results of this project have been documented in a report. After this project, she worked on a second ABID2 project also financed by the FNRS. This project was an extension of the first and was done in collaboration with the EPFL and the University of Lugano. Within the Framework of this project, she studied risk issues concerning the use of fake fingerprints to attack a biometric system. The results of this project have been documented in two articles titled "Vulnerabilities of fingerprint reader to fake fingerprints attacks" and "Risk evaluation for spoofing against a sensor supplied with liveness detection". At the present time, she is working as Substitute Senior Lecturer at the School of Criminal Law /Forensic Science Institute, University of Lausanne, and is finishing her PhD (Biometric Identity Documents – Problematic associated with fake fingerprints detection) under the supervision of Professor Christophe Champod.

Armindo Freitas-Magalhães, Ph.D., is Professor of Psychology at University Fernando Pessoa Health Sciences School. He is also the founder and Director of Facial Emotion Expression Lab (FEELab). Dr. Freitas-Magalhães is the only all universities in the world distinguished by the Encyclopedia of Human Behavior in the area of Facial Expression of Emotion and recently published by Academic Press, a seal of Elsevier (www.elsevier.com), Oxford. Editor-in-Chief of the Journal of Brain, Face and Emotion and member of the American Psychological Association (APA), International Neuropsychological Society (INS), European Health Psychology Society (EHPS), the International Society for Research on Emotion (ISRE), and the International Brain Research Organization (IBRO). Dr. Freitas-Magalhães is the author of FACE, a scientific project in Portugal that will allow neuropsychological mapping of the Portuguese facial expression. The FACE imaging technology will contribute to a database of facial expression available for the most diverse social applications, such as health, justice and education. His research focuses on neuropsychology, physiological psychology, psychology of emotions, facial emotion expression and human-computer interaction, human smile and cross-cultural nonverbal behavior. During the last twenty years, his principal research has been on human emotions and the influence of smile on emotional disorders such as depression. More recently he has conducted research on the cognitive and emotional processes of reading human faces. His research and clinical-forensic expertise includes investigative interviewing, credibility assessment, forensic assessment, facial expression of emotion and variables associated with eyewitness memory in victims and offenders of crime and trauma. He has also provided consultation and training overseas. Dr. Freitas-Magalhães is the author of several IT applications and interfaces in relation to emotions and facial expression. Currently, he is the leader of the international scientific project "The Brain and The Face", which has become a global interaction and scientific production tool, of inestimable usefulness in the academic world, will continue to pave the way for new volumes in the Studies in Brain, Face and Emotion series. This series involves colleagues, partners and internationally-renowned professors and researchers, e.g., of the American Psychological Association (APA), the Columbia

University, the Mount Sinai School of Medicine (Dep. of Neurology), the University of New York, the Baylor College of Medicine, The University of Oxford (Dep. of Psychiatry), the King´s College London (Institute of Psychiatry).

Alan Gelb is Senior Fellow at the Center for Global Development in Washington DC. His research interests are in the areas of the management of resource-rich countries, the role of identification in development and the use of biometric ID technology, improving the effectiveness of foreign assistance and the economies of Africa. Prior to joining the Center, he was Director of Development Policy at the World Bank. His previous positions included Chief Economist for Africa at the World Bank.

Richard Guidorizzi joined I2O as a Program Manager in September 2010. Mr. Guidorizzi has 22 years of experience bringing innovation into the operational environment. He began his career as a network and systems engineer, providing engineering support to federal and defense clients in the area of IT operations. After providing critical support to maintain command and control for the infrastructure at the Pentagon after 9-11 he moved into corporate leadership positions on contracts providing IT support to the Pentagon infrastructure and the Missile Defense Agency headquarters. He joined DARPA as the Director of the Information Resources Directorate in November 2007, and established the Technology Development and Integration division in July 2010.

Barry Guihen is a graduate of International Relations from Queens University, Belfast. He works as Researcher at the Centre for Science, Society and Citizenship, focusing on ageing and the use of ICT with respect to EU fundamental rights, and the ethical issues surrounding vaccination programmes and communication during pandemics.

Claire Hardaker is a forensic linguist who specialises in online deception, aggression, and manipulation. She typically research these phenomena by combining forensic linguistics (manual, qualitative analysis) with corpus linguistics (automated, quantitative analysis).

Adam Harvey is an artist whose work explores the intersection of privacy, surveillance, and fashion. His work has been awarded with a Core77 design award and covered by numerous publications including Wired, The New York Times, Spiegel, La Repubblica, and Le Monde. He lives and works in NYC and is currently developing CV Dazzle, camouflage from face detection, and other privacy-protecting accessories.

Edward Higgs was an archivist at the National Archives in London, from 1978 to 1993, and then held various posts at Oxford and Exeter. In 2000 he moved to the History Department at the University of Essex, where he is now Professor in History. He studies the history of the Information State, and of identification.

Young-Bin Kwon is professor of School of Computer Science and Engineering at Chung-Ang University, Seoul, Korea since 1986. He served as the Dean of Graduate School of Information, the Director of Information and Telecommunication Research Institute (ITRI), and the Director of Computing Center at Chung-Ang University between 2002 and 2006. He was a Governing Board

member of International Association for Pattern Recognition (IAPR) from 1995 to 2010 and served also TC-10 chair and standing committee member of conerences and meetings. In 2007, he was elected as the President of Korea Association of University and Computer (KAUIC) for 4 years. In 2002, he becomes the convener of ISO/IEC JTC1/SC37/WG2 (Biometric Technical Interfaces) to develop biometric international standards.

Chang-Tsun Li received the BSc degree in electrical engineering from Chung-Cheng Institute of Technology (CCIT), National Defense University, Taiwan, in 1987, the MSc degree in computer science from U. S. Naval Postgraduate School, USA, in 1992, and the Ph.D. degree in computer science from the University of Warwick, UK, in 1998. He was an associate professor of the Department of Electrical Engineering at CCIT during 1998-2002 and a visiting professor of the Department of Computer Science at U.S. Naval Postgraduate School in the second half of 2001. He is currently a professor of the Department of Computer Science at the University of Warwick, UK, the Editor-in-Chief of the International Journal of Digital Crime and Forensics. He is also the coordinator of the international joint project entitled Digital Image and Video Forensics funded through the Marie Curie Industry-Academia Partnerships and Pathways (IAPP) under the EU's Seventh Framework Programme (FP7) from June 2010 to May 2014. His research interests include digital forensics, multimedia security, bioinformatics, computer vision, image processing, pattern recognition, evolutionary computation, machine learning and content-based image retrieval.

Sebastien Marcel (http://www.idiap.ch/~marcel/) is senior research scientist at the Idiap Research Institute (http://www.idiap.ch). He manages research projects on biometric person recognition and supervises a team of 8 researchers (4 PhD students and 4 Post-Docs). He is currently interested in multi-modal biometric person recognition (face detection, face recognition, speaker recognition, EEG-based person recognition), man-machine interaction (hand gesture recognition) and content-based multimedia indexing and retrieval. He has obtained his PhD in signal processing from "Universite de Rennes I" in France (2000) at CNET, the research center of France Telecom (now Orange Labs). After his PhD, he joined the Dalle Molle Research Institute for Perceptual Artificial Intelligence as a Post-Doc. Then he obtained a permanent position as a research scientist. In 2008, he was promoted to a senior research scientist position. In January 2010, he was appointed Visiting Professor at the University of Cagliari (IT) where he taught a series of lectures in "face recognition'". He will be teaching "Fundamentals in Statistical Pattern Recognition" at Ecole Polytechnique Fédérale de Lausanne (EPFL) in the Spring semester 2012-2013. From January 2008 to December 2010, he was the main coordinator of the research project "MOBIO" (http://www.mobioproject.org/) on mobile biometry funded by the 7th European Research Framework Programme (FP7). Since January 2010, he is involved in the EU FP7 project "Bayesian Biometrics for Forensics". Since November 2010, he is the main coordinator of the EU FP7 research project "TABULA RASA" (http://www.tabularasa-euproject.org/) to study spoofing attacks in biometric systems. And since March 2012 he is also the main coordinator of the new EU FP7 research project "BEAT" (http://www.beat-eu.org/) to standardize biometrics evaluation and testing.

Emilio Mordini is a Psychiatrist and Philosopher. He has been trained as a psychoanalyst and was partner of the Psychoanalytic Institute for Social Research (1986-2001). From 1994 to 2006 Emilio taught bioethics in the Medical School of the University "La Sapienza" of Rome and served

as a scientific secretary of the Bioethical Commission of the Italian National Research Council (CNR). Focusing his efforts on creating an international research centre devoted to ethical, political and social implications of emerging technologies, in 2002 Emilio founded the Centre for Science, Society and Citizenship (CSSC), an independent, non-partisan, research centre, whose aim is to contribute to a better understanding of the contemporary world by clarifying the human factors which shape technological innovation. Emilio has participated either as a partner or a coordinator to a number of international collaborative projects co-funded by the European Commission. Emilio serves as a scientific secretary of the Italian Alliance on Biometric Technology established under the aegis of the Ministry of Research and University and in the board of a number of international scientific associations. Emilio has extensively published in academic peer reviewed, and non academic publications, and edited 9 books.

Glen Newey is a political philosopher with broad interests, including liberalism, freedom of speech, toleration, political deception, value-pluralism and the political theory of Thomas Hobbes. His books include Virtue, Reason and Toleration (1999), After Politics (2001), Hobbes and Leviathan (2007), Freedom of Expression: counting the costs (2008) and (with John Horton) The Political Theory of John Gray (2008). He has recently finished a further book on the politics of toleration and is currently completing an extending essay on freedom and justice.

Alexander Nouak is head of the Competence Center "Identification and Biometrics" of the Fraunhofer Institute for Computer Graphics Research IGD in Darmstadt, Germany. He is responsible for the acquisition, the management, and the controlling of various applied research and development projects. His department staff currently consists of seven scientists, and, in addition, several guest researchers and student research associates. Alexander Nouak was coordinator of the project BEST Network funded within the 7th framework for research programme by the European Commission. Before he was responsible for "Research and Technology" within the Integrated Project "3D Face" funded within the 6th FRP that aimed for unattended border control. He is an active member of the DIN NIA 37 working group on biometrics as well as a contributor to the WG5 on "Biometric testing and reporting" of ISO/IEC JTC1 SC37. Since 2009, Alexander Nouak is a certified Common Criteria Evaluator (CC 3.1). As a member of the Gesellschaft für Informatik (GI) he participates in the steering committee of the special group BIOSIG. Alexander Nouak is chair of the European Association for Biometrics EAB.

Gianluca Petrosino obtained an Electronic Engineer Master Degree from the University of Genoa in 1987. He has been working as Integrated circuit Designer, Manager and Director at the ST Microelectronics Semiconductor Company. He is author of 6 patents on Flash Memory and Microprocessor Design. In the same Company he has been also IT Director and then Region America Marketing Director. In 2010 he moved to Unicredit, where he is actually working in the Innovation Scouting & Research Group, mostly focusing on innovative technologies for the Bank business.

Andrew P. Rebera works at the Centre for Science, Society and Citizenship, where his research focuses mainly on the ethical, societal and legal implications of (inter alia): identification technologies; biometrics; privacy and data protection; surveillance; security; and disaster and CBRN response. At present he follows three EC projects funded under FP7. TABULA RASA concerns spoofing attacks on biometric systems, and includes one of the first investigations of the

ethical implications of anti-spoofing technologies; CATO concerns CBRN (Chemical, Biological, Radiological, Nuclear) response; while PACT assesses public perception of the supposed trade-off between privacy and security. Andrew studied at the University of Sussex, where he took a DPhil in philosophy, focusing upon foundational issues in identity, language, philosophical logic, metaphysics, science and mathematics.

Jörg Resch, born in 1959, looks back on over 15 years of experience in Identity Management projects and their implementation in both SMUs and large corporations. For a number of years he led leadership positions in software product development and published many technical articles on a wide range of IM-related subjects

Fabio Roli received his M.S. degree, with honours, and Ph.D. degree in Electronic Engineering from the University of Genoa, Italy. He was a member of the research group on Image Processing and Understanding of the University of Genoa, Italy, from 1988 to 1994. He was adjunct professor at the University of Trento, Italy, in 1993 and 1994. In 1995, he joined the Dept. of Electrical and Electronic Engineering of the University of Cagliari, Italy, where he is now professor of computer engineering and head of the research group on pattern recognition and applications. He is the Director of the Laboratory on Ambient Intelligence of the Science&Technology Park in Sardinia, Italy. Dr Roli's current research activity is focused on multiple classifier systems and their applications to biometric personal identification, multimedia text categorization, and computer security. Dr Roli serves as member in many panels of funding agencies, including the NATO advisory panel on Information and Communications Security. He is a member of the governing boards of the International Association for Pattern Recognition and of the IEEE Systems, Men and Cybernetics Society. He is Fellow of the IEEE, Fellow of the International Association for Pattern Recognition, and member of the TIS (Top Italian Scientists) list.

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Mario Savastano received his degree in electronic engineering from the "Federico II" University of Napoli. He has a background in digital signal processing, electrical/electronic measurements and simulation of systems. In 1982, he joined the National Research Council of Italy (Consiglio Nazionale delle Ricerche, CNR), and currently holds the position of Senior Researcher at the Institute of Bio-structures and Bio-images. In 2001 he became a member of the Biometric Consortium ad-hoc group on Performance and Testing, and in 2002-2003 Mario Savastano was the leader of the research on medical issues in biometrics in the framework of the EU-funded "Biovision" project which drew up a roadmap for the European biometric community to follow. Mr. Savastano has been the Convener of the ISO/IEC JTC1 SC 37 WG 6 on "Cross-jurisdictional and societal aspects" of Biometrics since 2002 and has represented SC37 at the April 2005 JTC 1 SWG on Accessibility Meeting. As for national activity, he is the IBB/CNR scientist responsible for research programs in the area of biometrics along with several Italian government agencies. Since 2004 he is one of the scientific consultants of the Competence Center on Biometrics owing to the

Italian National Center for Information Technology in the Public Administration. The current research activity of Mr. Savastano concerns the evaluation of non-technical aspects of biometrics and face recognition algorithms.

Roberto Tavano is an experienced international business professional, his current responsibility being to drive sales of the Unisys portfolio of enterprise security solutions across various geographies. In a previous life, he had served as a VP with Capgemini and as a partner with Ernst & Young, leading the e-Business and Supply Chain practices. He is a regular guest speaker at international conferences, sought for interviews by media, and has published several white papers and articles. Roberto is a Physics graduate of the University of Trieste, Italy.

Massimo Tistarelli received a Phd in Computer Science and Robotics in 1991 from the University of Genoa. He is currently Full Professor in Computer Science and director of the Computer Vision Laboratory at the University of Sassari, Italy. His main research interests cover biological and artificial vision, biometrics, robotic navigation and visuo-motor coordination. He is a founding member of the Biosecure Foundation, which includes all major European research centers working
in biometrics. Since 1986 he has been involved as project coordinator and task manager in several projects on computer vision and biometrics funded by the European Community. He also firstly proposed a unique, advanced method for the integration of face and fingerprint modalities already at the feature level. In 1991 he was awarded the best paper award from IEEE Computer Society.

James L. Wayman is a research administrator at San Jose State University in California, USA, and an honorary Professor in the School of Engineering and Digital Arts, University of Kent, UK. He is a member of the British national body to the ISO/IEC SC37 standards committee on biometrics, where he serves as editor of the Speech Data Format (ISO/IEC 19794-13) and as "Principal UK Expert" on vocabulary and concept harmonization. He has been a paid advisor on biometrics to 10 national governments.

Peter Went is the Chief Executive Officer of WCC, where his role is to oversee the company's operations in The Netherlands and the United States. Prior to WCC, Peter Went held a number of leadership positions with different high tech companies. He served as CTO of Quality System Development, which developed and marketed an integrated banking system for European banks. He also was Founder & CEO of UniSoft, where he orchestrated the company's expansion into Prague. Being an internationally recognized expert in Identity Management systems, Mr. Went has spoken at a number of occasions, including ID world, RISE, BCC and Security Symposium. Mr Went was recently awarded the ID People Trailblazer Award, for his contribution to the integration of biographic and biometric identification capabilities.

TABULA RASA
Trusted Biometrics under Spoofing Attacks
http://www.tabularasa-euproject.org/

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