Preface

TECHNOETHICS AND THE ETHICAL IMPACT OF TECHNOLOGICAL ADVANCEMENTS AND APPLICATIONS IN SOCIETY

The Challenge of Technological Systems and Society

Following the 2011 Fukushima-Daiichi nuclear plant disaster, I was invited to deliver the keynote address for the Value and Ethics Conference hosted by the Canadian Nuclear Safety Commission in Ottawa, Canada. The conference brought together top-level government decision-makers, nuclear energy leaders (public and private), and other stakeholders from the nuclear energy sector. If that had been a decade ago, I would have felt out of place: Why would a government body want to have an outsider lead off a government sponsored event? I was not and had never been a civil servant in the government. And why would a national nuclear energy governing body (public or corporate) wish the expertise of someone who was not an engineer, nuclear physicist, or other nuclear energy expert traditionally sought out to speak on safety standards and regulations within the nuclear energy sector?

However, this type of work was not out of the ordinary in 2011. It made me reflect on the gradual shift in approach to technological advancements and applications I had been witnessing for a number of years within various organizations and areas of public life. I was witnessing a paradigm shift in how society viewed and approached technology. The keynote presentation entitled, "Technoethics and the Future of Nuclear Energy in Canada," explored the ethical implications for human life, public values, and ecological impacts created by society's complex relationship with the development and regulation of nuclear energy technology. Nuclear technology was not a simply hammer that could be disposed of once interest waned in its usefulness. Nuclear waste lasts many lifetimes, cannot be easily disposed of, and poses serious environmental risks for society and the future of society. Like many large-scale technological advancements in the 20th and 21st century, nuclear energy development exemplified a potent technology, which required greater care and caution than previously developed technologies. This required a shift in how society approached it.

Technology, once approached as an empirical object (or collection of objects) that could be built up, isolated, and measured in the external world separate from human beings, was now being treated more and more as a complex social system defined by a complex set of human-technological relations embedded in life and society. In other words, the real world of technology had a human face and the new paradigm that was emerging was one founded on the appreciation of technology as a complex social system within which humans were entrenched. This technological systems paradigm highlighted the need for new types of expertise about social and ethical values in connection with technological systems.

In response, an amassing body of interdisciplinary research dedicated to social and ethical aspects of technology has emerged under the umbrella of Technoethics.

The Changing Face of Academia

Much of the recent popularity of Technoethics stems from a rising pragmatic and interdisciplinary orientation attractive to 21st century academics interested in access to an open (silo-free) forum for academic exchange on real life problems and opportunities of technology in society. In recent years, we have witnessed the landscape of academic move towards inter- and multidisciplinary collaborations to advance a multi-faceted knowledge base of expertise required to solve increasing complex problems faced by our changing society. Discipline specific work has always been recognized for its foundational appeal of possessing unitary knowledge bases and its strong reputation established over time and built up within separate academic departments. As noted by Pierce (1991):

Although most studies fail to define the term explicitly, they typically assume that boundaries of disciplines closely follows those of academic departments. The use of such boundaries may seem to fix overly concrete limits on a highly abstract phenomenon, excluding too large a number of people with interest in the subject. But its importance in creating and maintaining disciplinary communities makes the academic department the building block from which disciplines are created (23).

The discipline dominant approach within traditional academia provided effective coverage of specific domains with established norms and well-defined boundaries to decide what is included and excluded within each discipline. As Foucault (1975, 1979) indicated, "The disciplines characterize, classify, specialize; they distribute along a scale, around a norm, hierarchize individuals in relation to one another and, if necessary, disqualify and invalidate" (p 223), but what happens when what is being studied cannot be easily classified, measured, or placed on a scale? What happens when the nature of what is being studied demands a pragmatic orientation where the creation of new knowledge needs to be context-specific, problem-focused, and multi-faceted in nature? The growth of inter- and multi-disciplinarity, what some scholars are referred to as post academic science (Zimon, 2000), is beginning to take its place alongside disciplinary work, particularity with respect to the study of technology.

Within this new academic landscape, the social and ethical problems surrounding the development and application of new technologies in society stands out as one of the most, if not the most pressing problems of our age. In response, a growing body of work forms the basis of the emerging field known as Technoethics.

The Rise of Technoethics as a Field of Academic Research

The recent emergence of Technoethics as a field of academic research is largely attributable to the coming together of a critical mass of dedicated technology experts (researchers, scholars, administrators, and practitioners) grappling the tough questions arising from the public controversies and ethical dilemmas created by technological development and application in society. The field allowed its contributors to go beyond traditional approaches to the study ethics of technology guided by established philosophical principles, intellectual analysis, and logical reasoning. It pulls together experts from established fields (e.g., bioethics, engineering ethics, computer ethics, etc.) with technology experts working in new areas

of technology research where social and ethical issues emerge (i.e., genetic research, nanotechnology, human enhancement, neurotechnology, robotics, reproductive technologies, etc.).

As pioneering breakthroughs are made in technological advancements and applications, novel questions arise regarding human values and ethical implications for society, many of which give rise to ethical dilemmas where conflicting viewpoints cannot be solved by relying on any one ethical theory or set of moral principles. Accordingly, the field of Technoethics takes a practical focus on the actual impacts (and potential impacts) of technology on human beings struggling to navigate the "real world" of technology. In many cases, this leads to the creation of more questions than answers in an effort to discern the underlying ethical complexities connected to the application of technology within real-life situations.

A number of recent publications under the umbrella of Technoethics are responsible for formalizing the field and providing a foundation of research and expertise upon which to build. The two volume Handbook of Research on Technoethics (Luppicini & Adel, 2009) pulled together over 100 experts from around the world working on a diversity of areas where technoethical inquiry is being applied. Following this, the first reader in Technoethics, *Technoethics and the Evolving Knowledge Society: Ethical Issues in Technological Design, Research, Development, and Innovation* (Luppicini, 2010), was published for use at the undergraduate and graduate level in a variety of courses that focus on technology and ethics in society. It explored a broad base of human processes and practices connected to technology embedded within social, political, and moral spheres of life. This text engaged students and researchers in critical debates connected to key ethical dimensions of a technological society. Its broad scope reinforced work appearing in the Handbook in an effort to highlight key topic areas of technoethical inquiry suitable for academic study. These publications helped set the stage for the academic journal that provides the main driving force for the field of Technoethics today.

In 2010, *International Journal of Technoethics* (Rocci Luppicini-Founding Editor-in-Chief) was launched to provide an ongoing forum for scholarly exchange among philosophers, researchers, social theorists, ethicists, historians, practitioners, and technologists working in areas of human activity affected by technological advancements and applications. With the strong support of IGI Global Publishing, the journal was assembled by its Editor-in-Chief and twelve associate editors, Allison Anderson (University of Plymouth), Keith Bauer (Marquette University), Josep Esquirol (University of Barcelona), Deb Gearthart (Troy University), Pablo Iannone (Central Connecticut State University), Mathias Klang (University of Lund), Andy Miah (University of the West of Scotland), Lynne Roberts (Curtin University of Technology), Neil Rowe (U.S. Naval Postgraduate School), Martin Ryder (Sun Microsystems), John Sullins III (Sonoma State University), Mary Thorseth (NTNU). The mission of the journal was as follows:

The mission of the International Journal of Technoethics (IJT) is to evolve technological relationships of humans with a focus on ethical implications for human life, social norms and values, education, work, politics, law, and ecological impact. This journal provides cutting edge analysis of technological innovations, research, developments policies, theories, and methodologies related to ethical aspects of technology in society. IJT publishes empirical research, theoretical studies, innovative methodologies, practical applications, case studies, and book reviews. IJT encourages submissions from philosophers, researchers, social theorists, ethicists, historians, practitioners, and technologists from all areas of human activity affected by advancing technology (International Journal of Technoethics, 2010).

The remarkable success of the journal can largely be attributed to unwavering publisher support, excellent associate editors and a large reviewer board of experts which expanded to over sixty members

in its first year of publication. This present volume is based on a collection of articles derived from the inaugural year of the *International Journal of Technoethics.* It provides coverage of cutting edge work from a variety of areas where technoethical inquiry is currently being applied within the field of Technoethics.

OBJECTIVES OF THIS BOOK

What makes the chapters in this volume important rests on a number of factors including content adherence to methodological procedures, peer review standards, contribution to research knowledge about technology and ethics, and contribution to practice. As a book dedicated to scholarship emerging from the interdisciplinary field of Technoethics, the coverage in this volume is intended to be broad reaching in an effort to mirror the breadth of technological advancements and applications where ethical issues arise. The book covers a range of topic areas from computing to transhumanism. As a book intended to reflect the pragmatic orientation of Technoethics as an applied field of study, the topics covered are also intended to be of public interest and timely. The book addresses key areas of technoethical controversy from cyber-espionage to human implants.

As the founding editor-in-chief of the *International Journal of Technoethics* from which the contents of this volume are derived, a number of challenges were faced in deciding the scope of publication coverage. From a layperson's standpoint, technology touches almost every aspect of contemporary work and life in some way, not all of which warrants an ethical inquiry. To provide an ethical inquiry of all technology takes away the importance of such an inquiry in contributing unique insights into special cases which runs the risk of trivializing the field, not to mention wasting limited time and resources required to carry out such intense work. After all, the real world of technology is vast and advances quickly. It does not wait for academics to catch up with it. Therefore, the focus of Technoethics in the journal and this publication is on controversial technologies. It deals with all areas of work and life where technological development and application have raised serious ethical challenges and produced public debate. Although much of this scholarly work is rooted in academic theory and knowledge, the reader will notice that there is a decidingly pragmatic orientation to most of this work connecting academic knowledge to real life problems revolving around technology and its use in society.

In terms of readership consideration, this volume goes out to an audience as broad as the interdisciplinary base of scholars that contribute to the field of Technoethics. From cyberbullying to nuclear technology waste disposal, the contributor base and intended readership is eclectic and coming from various disciplines and fields. Because technology is designed, developed, and applied at so many levels of life and society one can expect that the readership will also come from different organizations and walks of life. This readership may include students, researchers, technologists, administrators, designers, instructors, etc. What binds this group together is the interest in technology and ethics which acts as the central organizing construct for delving into established theories and practices in an effort to understand and explain ethical controversies surrounding technology. Knowledge gained is intended to inform technology practices and leverage decision making to maximize the benefits of and minimize negative risks and consequences of technology.

ORGANIZATION OF THE BOOK

This volume deals with complex ethical issues and dilemmas within the field of Technoethics. It attempts to address a number pivotal questions arising in contemporary life revolving around some of the most controversial areas of ethics and technology: How are human thoughts, actions, and interactions mediated by technology? What is a moral mediator? What are the ethical implications of human-technological relations with respect to cultural objects and societal structures? What are the ethical implications of ubiquitous computing? How can the problems of an ethical judgment on science and technology be correctly approached? What ways of ethical thinking can guide new policies and laws that will protect human dignity in the advancing technological world? What ethical guidelines are relevant for safe-guarding online interaction and virtual life? What ethical guidelines are needed to deal with pervasive problems of online misconduct such as cyberbullying and cyberstalking? What ethical implications are there when dealing with human implantation? Does it make sense to consider the functional morality of robots? What measures can be taken to combat cyber-terrorism and ensure high standards of ethical journalism? What ethical considerations need to be made in the deployment of cyberweapons? These are some of the questions that this volume deals with.

In terms of the organization of this book, twenty-one chapters are divided into four sections in an effort to provide the reader with a logical flow writing organized according to a thematic scheme. Section 1: **Theoretical Perspectives** contains five chapters: Chapter 1, "*Material Cultures and Moral Mediators in Human Hybridization*" (Lorenzo Magnani), Chapter 2, "*The Significance of the Ethics of Respect*" (Josep M. Esquirol), Chapter 3, "*How Can the Problems of an Ethical Judgment on Science and Technology be Correctly Approached?*" (Evandro Agazzi), Chapter 4, "*Technology Traps: Who is Responsible?*" (Peter B. Crabb and Steven E. Stern), and Chapter 5, "*Ubiquitous Computing: Any Ethical Implications?*" (J. A. Quilici-Gonzalez, G. Kobayashi, M. C. Broens, and M. E. Q. Gonzalez).

Section 2: **Technoethics and the Digital Society** contains five chapters: Chapter 6, "*Identifying the Ethics of Emerging Information and Communication Technologies: An Essay on Issues, Concepts, and Method*" (Bernd Carsten Stahl et al.), Chapter 7, "*The Regulation of Gaze and Capture: New Media and the Image Economy*" (Yasmin Ibrahim), Chapter 8, "*Peer-to-Peer File-Sharing: Psychological Reactance and the Theory of Planned Behaviour*" (Peter Allen and Lynne Roberts), Chapter 9, "*An Exploratory Study of the Cyberbullying and Cyberstalking: Experiences and Factors Related to Victimization of Students at a Public Liberal Arts College*" (Ellen Kraft and Jinchang Wang), Chapter 10, "*Cyberbullying: A Sociological Approach*" (José Neves and Luzia de Oliveira Pinheiro).

Section 3: **The Ethical Side of Technological Applications** contains six chapters: Chapter 11, "*Reclaiming the Green Continent: Ecology, Globalization, and Policy and Decision in Latin America*" (Pablo Iannone), Chapter 12, "*The Ethics of Outsourcing Online Survey Research*" (Peter J. Allen and Lynne D. Roberts), Chapter 13, "*The Issues Related to Student Authentication in Distance Education*" (Deb Gearhart), Chapter 14, "*Amateur vs. Professionals Politics, Citizenship, and Science*" (Antonio Lafuente and Andoni Alonso), Chapter 15, "*The Ethics of Cyberweapons in Warfare*" (Neil C. Rowe), and Chapter 16, "*Not Just Software: Free Software and the (Techno) Political Action*" (Blanca Callén et al.).

Section 4: **New Trends in Technoethics** contains five chapters: Chapter 17, "*Shaping the Ethics of an Emergent Field: Scientists' and Policymakers' Representations of Nanotechnologies*" (Alison Anderson and Alan Petersen), Chapter 18, "*Transhumanism and Its Critics: Five Arguments against a Posthuman Future*" (Keith A. Bauer), Chapter 19, "*Human Implants: A Suggested Framework to Set Priorities*" (Laura Cabrera), Chapter 20, "*The Functional Morality of Robots*" (Linda Johansson), and Chapter 21,

"*Cyber-Terrorism and Ethical Journalism: A Need for Rationalism*" (Mahmoud Eid). A more detailed preview of each chapter is provided below.

How are human thoughts, actions, and interactions mediated by technology? What is a moral mediator? What are the ethical implications of human-technological relations with respect to cultural objects and societal structures? In Chapter 1, "*Material Cultures and Moral Mediators in Human Hybridization*," Lorenzo Magnani explores the complex relation between material culture and distributed cognition while highlighting the importance of technological artifacts as moral mediators. This stimulating chapter contributes valuable insight on the role of moral mediators and the challenge of cultural isolation within key domains of human activity affected by advancing technology.

What does respect mean? What merits respect within contemporary society? How can an ethics of respect be useful as a guiding tool within our contemporary society shaped by science and technology? In Chapter 2, "*The Significance of the Ethics of Respect*," Josep M. Esquirol investigates the conceptualization of respect and proposes an approach to the ethics of respect as a means of addressing current challenges faced by a society shaped by technology. By examining the notion of 'respect' at great lengths, the author attempts to show how it relates to an attentive gaze as the essence of respect. This thought-provoking chapter has promising applications within multiple fields including, ecology, medicine, education, and political science.

Does an ethical evaluation of science and technology make sense? There is a pervasive division in positions concerning whether or not an ethical evaluation of science and technology is appropriate. At one extreme end, some scholars believe that ethical judgments must not be introduced at all in the business of science and technology, while other scholars at the opposite extreme hold that ethical judgements are legitimate and should be mandatory in science and technology practice. In Chapter 3, "*How Can the Problems of an Ethical Judgment on Science and Technology be Correctly Approached?*" Evandro Agazzi examines existing arguments for and against the use of ethical judgments in science and technology in an effort to clarify the debate.

Technology draws people in like magpies to shiny bits of sparkling metal. As we all know, despite the 'bells and whistles' appeal of new technologies, they can also have a lasting negative impact on individuals, society, and the environment. These "technology traps" can be said to occur when individuals and societies become caught up with technologies and the harmful consequences produced by these technologies. In Chapter 4, "*Technology Traps: Who is Responsible?*" Peter Crabb and Steven Stern provide an insightful breakdown of five technology traps that they believe plague our current society. These are: incompetence, self-miscontrol, misbehavior, techno-centrism, and environmental degradation. The chapter discusses the ethical responsibility for these traps with respect to individual technology users, businesses, and government.

In this day and age, the once speculative idea of ubiquitous computing (information-processing capacity from computers available everywhere at any time, and integrated into everyday objects and activities) is a common reality that disappears into the background for many of us until, that is, there are reasons to question ubiquitous computing, and that is what is done in Chapter 5, "*Ubiquitous Computing: Any Ethical Implications?*" Key questions addressed include: What are the possible ethical implications ubiquitous computing systems in human perception/action? and how can the widespread application of ubiquitous computing systems affect the behaviour of individuals as embodied embedded agents? In this chapter, the authors provide an interdisciplinary perspective on the possible ethical implications of the presence of ubiquitous computing systems in human perception/action. The authors draw insightful

contrasts for readers between traditional considerations of ethical issues and the Ecological Philosophy view concerning its possible consequences in the context of perception/action.

One of the most popular areas of Technoethics deals with the ethical issues of Information and Communication Technologies (ICTs). These issues are particularly salient in the public sphere where can have a profound impact on individual freedom, and happiness, and one's ability to lead a good life. This is partly why policy makers are so invested in discerning key ethical issues of ICTs and their consequences. The best way of creating ICT policy that is sensitive to ethical issues pertain to being proactive in addressing such issues at an early stage of the technology life cycle. To this end, Chapter 6, "*Identifying the Ethics of Emerging Information and Communication Technologies: An Essay on Issues, Concepts, and Method*" explores how knowledge of ethical aspects of emerging ICTs can be gained using a suggested methodology put forth by the chapter authors. This chapter makes a unique contribution by sketching out how a proper description of emerging ICTs can be used for an ethical analysis.

In recent years, the field of Technoethics has also begun delving into the study of the human identity and the body. The is largely due to the increasing importance of digital technology in the mediation in our identity along with the advancement of human enhancement technologies that allow us to alter aspects of our identity in significant ways that raise serious ethical questions. Chapter 7, "*The Regulation of Gaze and Capture: New Media and the Image Economy*" by Yasmin Ibrahim offers a novel perspective on this technoethical topic by focusing on how digital image capture has given rise to new forms of human gaze which has ethical, legal and social implications for societies. Yasmin Ibrahim reflects on the paradoxical state of this image economy where gaze, through mobile recording devices, can be both empowering (i.e., holding authorities accountable) and disempowering (i.e., invading privacy and enabling voyeurism). In response, this chapter offers a fresh perspective on how the digital image economy is creating new ways of at each other along with the countermeasures created to regulate image capture. The implications of this emerging digital image economy represent a serious ethical challenge for Internet users, regulators, and authorities that is only beginning to be understood within society.

Tackling a slightly different area of digital technology mediation, Chapter 8, "*Peer-to-Peer File-Sharing: Psychological Reactance and the Theory of Planned Behaviour*" by Peter Allen and Lynne Roberts presents an empirical study exploring a persisting trend in sharing and downloading media files over Peer-to-Peer (P2P) networks. Specifically, this research study draws on the Theory of Planned Behaviour (TPB) and examines whether or not psychological reactance could account for variance in individuals' intent to engage in, such behaviour. Interestingly enough, no support for psychological reactance as a predictor of P2P file downloading intent or behaviour is found. Rather, findings reveal that attitude, subjective norms, and perceived behavioural control were mediated by behavioural intent. Chapter interpretations offer a novel explanation with promising research potential for future work on human values and online misconduct.

Extending the discussion on technoethics and digital technology, the phenomenon of cyberbullying has risen to be one of the greatest fears of educators and parents around the globe when it comes to Internet use among children. On the one hand, the use of the Internet is becoming more and more embraced in educational settings to better prepare children for the real world and the digital knowledge economy that continually expanding. On the other hand, exposing children to the Internet also opens the door to new forms of exploitation and abuse that parents want to protect their children against. With this in mind, two chapters in this volume deal with the growing epidemic of cyerbullying. Chapter 9, "*An Exploratory Study of the Cyberbullying and Cyberstalking: Experiences and Factors Related to Victimization of Students at a Public Liberal Arts College*" by Ellen Kraft and Jinchang Wang. This

chapter presents findings of a study on cyberbullying and cyberstalking experiences of students. The study found that college students under 25 years of age were experiencing and participating in cyberbullying at higher rates than older college students and that prior experience of cyberbullying in high school was a significant risk factor for cyberbullying and cyberstalking in college. Next, Chapter 10, "*Cyberbullying: A Sociological Approach*" by José Neves and Luzia de Oliveira Pinheiro takes a step back to look at cyberbullying through a sociological lens. In this insightful chapter, the authors conduct an exploratory study on cyberbullying among Portuguese university students. This chapter helps to clarify the relationship between bullying and cyberbullying and posit a unique model that helps explain the emerging nature of cyberbullying based on the theoretical contribution of Gregory Bateson. Both chapters make useful contributions to empirical research that advances knowledge on cyberbullying.

Beyond technoethical concerns that target individuals and groups, there are also technoethical considerations to address at the national level when technological innovation and economic development are at issue. Chapter 11, "*Reclaiming the Green Continent: Ecology, Globalization, and Policy and Decision in Latin America*" by Pablo Iannone addresses environmental concerns created by the impact of technology within economic activity. These macro level technoethical concerns faced by countries around the world create serious challenges to overcome and raise important questions to consider: How has technological and economic development in Latin America (and countries beyond Latin America) impacted ecological stability in ways that raise ethical challenges? What policy problems does the current state of technological and economic development in Latin America pose and what legalistic approaches and decision-making strategies have been used in addressing the situation? What lessons can be learned to advance ethical technological and economic development to help safeguard the environment for generations to come?

One of the consequences of increased Internet penetration over the last decade is that web surveying among researchers has become increasingly prevalent but are their ethical issues to consider. The answer is unmistakably yes. Chapter 12, "*The Ethics of Outsourcing Online Survey Research*" by Peter J. Allen and Lynne D. Roberts explores a trend in online research where academics and research students are outsourcing the design and/or hosting of their research to external service providers. This chapter a number of key ethical concerns including, possible threats to confidentiality and anonymity, the potential for loss of control over research data decision-making, and the reduced credibility of research. This chapter provides excellent recommendations on proper guidelines for academic institutions and researchers interested in outsourcing parts of their online research activity.

Technoethical inquiry is also pursued in higher education, especially when faced with ethical controversies surrounding the delivery of online courses and distance education programs with rely heavily on digital technology. Deb Gearhart's Chapter 13, "*The Issues Related to Student Authentication in Distance Education*" discusses current forms of student authentication and core technoethical issues related to student

authentication. It poses a number of questions that administrators of higher education are currently struggling with: Why is there a concern for student authentication in distance education and electronic assignment submissions? How do instructors know the student turning in the assignment is the student registered for the course? Will universities be forced to use biometric identification or is it unnecessary to go to such lengths?

Chapter 14, "*Amateur vs. Professionals: Politics, Citizenship, and Science*" by Antonio Lafuente and Andoni Alonso explores the growing public distrust in techno-scientific development since WWII. There is a growing concern that scientific and technological expertise is currently experiencing a crisis and that

public trust concerning many aspects related to the techno-scientific development is waning. This chapter offers a fresh perspective on specific features of public doubt towards techno-scientific development today. In addition, the chapter provides valuable insights on how to make scientific and technological research more participative in spirit in an effort to win back public trust and reshape traditional ideas on science, technology, and progress to better adapt to public needs and interests.

It has been said that the next world war will be fought by pressing a few buttons rather than battling it out in the trenches. What kind of ethical standards can be applied to modern weaponry like cyberweapons which appear so different in form and function than traditional weapons? In Chapter 15, "*The Ethics of Cyberweapons in Warfare*," Neil Rowe explores the ethical implications of using cyberweapons to attack computer data and other software during warfare. Insightful arguments are offered to treat cyber-weapons more seriously since they have the potential to inflict harm like any other weapon. Assuming that unprovoked cyberattacks are illegal and unethical, does the same apply to cyber-counterattacks? This chapter raises valuable questions that provoke discussion.

Over the last decade, the free software movement has been a hot topic within economics, law, and political science as it pertains to discussions of democracy, equality, and intellectual property. As a result of this movement, society has begun to rethink the meaning of democratic participation along with the new technological forms of political action available to for political activists (aka techno-activism). In response to this movement, Chapter 16, "*Not Just Software: Free Software and the (Techno) Political Action*" explores the political challenge resulting from the free software movement from the standpoint of Hardt and Negri's (2000) theoretical work. This chapter helps discern key areas challenges and opportunities associated with techno-activism.

In a slightly different area, nanotechnology has raised new questions about issues of responsibility, accountability, and ownership: What do citizens know (and need to know) about the potential risks of nanotechnologies and their possible negative consequences? Which individuals (and groups) will be most affected by nanotechnology development? Who (or what organization) is most likely to control and benefit from various nanotechnology applications? Alison Anderson and Alan Petersen's Chapter 17, "*Shaping the Ethics of an Emergent Field: Scientists' and Policymakers' Representations of Nanotechnologies*," uses data from a UK-based research project, to help explain how scientists' and policymakers' positions on nanotechnologies have a very real impact on public opinion about ethical aspects of nanotech development.

In Chapter 18, "*Transhumanism and Its Critics: Five Arguments against a Posthuman Future*" by Keith Bauer deals with the topic of transhumanism and the current heated public debate about the acceptability of human enhancement technology. How much should individuals be able to alter themselves? Is there a limit to what can be considered human? This chapter provides an excellent background reading on the transhumanism movement that embraces the transformation of human nature through pharmacology, genetic manipulation, cybernetic modification, nanotechnology, and a variety of other technologies. In addition, the chapter presents and discusses a variety of arguments and counterarguments to transhumanism in an effort to clarify popular misunderstandings and shed light on what is core in this heated debate.

In Chapter 19, "*Human Implants: A Suggested Framework to Set Priorities*," Laura Cabrera discusses one set of particularly controversial technologies which has the potential treat many human impairments but at the risk of reaching a stage beyond current human capacities and abilities. In this sense, human implants blur the line between therapy and enhancement creating new regulatory challenges in public health and public research funding. There is also the risk of further contributing to the existing 'technology-divide' and the inequalities that give unfair advantages to some over others. This chapter

proposes closer scrutiny in dealing with human implants and need for a clear set of priorities when using human enhancement technologies.

In Chapter 20, "*The Functional Morality of Robots*," by Linda Johansson, the focus on technoethics turns from technologies for human enhancement to a special variety of technologies for human service that grew out of robotics. Once restricted to science fiction writings, robotics has evolved greatly over the last three decades, providing us with robots with increasingly sophisticated capacities and human uses in life and society. Given such complexity, what happens when negative consequences arise from robot actions? How should moral responsibility be assigned, if at all, to our robot creations?

The author in this chapter argues for the similar ascription of moral responsibility for robots and for humans based on a moral version of the Turing Test—a Moral Turing Test (MTT). That chapter takes the position that we should hold the robot morally responsible for actions and draws on anecdotal cases to illustrate.

In the final chapter, Chapter 21, "*Cyber-Terrorism and Ethical Journalism: A Need for Rationalism*," Mahmoud Eid tackles a very real fear that dominates current public forums and mass media broadcasts. Although terrorism has been a continual threat in traditional and contemporary societies, its recent evolution leveraged by new media technology and cyberspace has given rise to cyber-terrorism, a new form of terrorism with new ethical challenges to consider. This insightful chapter paper sheds light on the current state of cyber-terrorism by discussing four cyber-terrorism cases covered by the media that represent the most recent cyber-terrorist attacks on infrastructure and network systems in recent years. In an effort to improve the situation, the chapter suggests treating cyber-terrorists as rational actors with media goals, which need to be acknowledged by journalists in providing media coverage. The chapter draws on ideas from rationalism and game theory, along with major journalistic ethical principles to help provide guidance for effective media decision-making during times of cyber-terrorism.

Overall, this assembly of technoethical research studies provides a glimpse of selected work from a variety of areas where technoethical inquiry is employed. The breadth of topics covered attests to the ubiquitous nature of technological development, which drives technoethical considerations in life and society. At the same time, it must be noted that this volume presents only a selection of the many research areas currently pursued and yet to be pursued within the rapidly evolving field of Technoethics.

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