A CULTURE OF ETHICS: ENGINEERING FOR HUMAN DIGNITY AND THE COMMON GOOD
### SCHEDULE

**THURSDAY OCTOBER 6, 2016**

**7 P.M. ~ KEYNOTE ADDRESS**
Anderson Student Center, Woulfe Alumni Hall North

**ETHICS AS DESIGN AS ETHICS**
Brad Kallenberg
Professor of Theology and Ethics, University of Dayton

**INTRODUCTION:**
Dean Terence Langan  Dean Donald Weinkauf
College of Arts and Sciences  School of Engineering

**8:30 P.M. ~ RECEPTION**
Woulfe Alumni Hall South

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**FRIDAY, OCTOBER 7, 2016**

**8:15 A.M. REGISTRATION ~ THIRD FLOOR, ANDERSON STUDENT CENTER**
Coffee available in Iversen Hearth Room
Overview of Friday concurrent sessions (Details and abstracts later in program)

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<th>Time</th>
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<td>9-10:30 a.m.</td>
<td><strong>Session 1:</strong> Teaching Engineering Ethics</td>
<td><strong>Session 2:</strong> New Challenges in a Technological Age</td>
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<td>10:30 - 11 a.m.</td>
<td><strong>COFFEE BREAK • IVERSON HEARTH ROOM</strong></td>
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<td>11 a.m.-12:30 p.m.</td>
<td><strong>Session 3:</strong> Vocation, Virtue, and Creation Stewardship</td>
<td><strong>Session 4:</strong> Making Decisions: Engineering Reasoning and Transportation Planning</td>
<td><strong>Session 5:</strong> Organizational Ethical Culture and Engineering Decision Frameworks</td>
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<td>12:30 - 2 p.m.</td>
<td><strong>LUNCH (A LIST OF DINING OPTIONS IS IN YOUR PACKET)</strong></td>
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<td>2-3:30 p.m.</td>
<td><strong>Session 6:</strong> Expanding the Discussion: Technology as a Moral and Theological Issue</td>
<td><strong>Session 7:</strong> Making a Difference: Engineering for the Common Good</td>
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<td>4-5 p.m.</td>
<td><strong>Session 8:</strong> The Practice of Ethics: Developing Virtue Through Small Choices</td>
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5:30 P.M. BANQUET
Ticketed in advance
Woulfe Alumni Hall South

7 P.M. KEYNOTE ADDRESS
Woulfe Alumni Hall North

CULTURE, ETHICS, AND ENGINEERING AT GENERAL MILLS
Gregg Stedronsky
Vice President for Global Engineering,
Safety and Manufacturing Excellence, General Mills

INTRODUCTION:
Richard Plumb
Executive Vice President and Provost

8:30 P.M. RECEPTION
Woulfe Alumni Hall South

SATURDAY, OCTOBER 8, 2016
8:15 am Coffee available in Iversen Hearth Room

9 A.M. ~ KEYNOTE ADDRESS
Woulfe Alumni Hall North

TUNING IN TO ETHICS
Michael J. Quinn
Dean of the College of Science and Engineering,
Seattle University

INTRODUCTION:
Camille George
Associate Vice Provost for Global and Local Engagement

11 A.M.-12 P.M. PANEL OF KEYNOTE SPEAKERS
Woulfe Alumni Hall North

“HOW CAN ENGINEERING EDUCATORS PREPARE STUDENTS
FOR A CULTURE OF ETHICS IN INDUSTRY?”

MODERATOR:
Dean Donald Weinkauf
School of Engineering
KEYNOTE SPEAKERS

Brad Kallenberg
Professor of Theology and Ethics,
University of Dayton

Brad J. Kallenberg, Ph.D., is Professor of Theology & Ethics at the University of Dayton (OH) where he has pioneered a course in engineering ethics that compares ethics to engineering design. After studying chemistry, then physics, on a scholarship to the University of Minnesota, Kallenberg eventually shifted his attention to topics arising at the interface of science, engineering and theology. He holds a Ph.D. in Philosophical Theology from Fuller Theological Seminary and has authored and/or edited six books including *Ethics as Grammar: Changing the Postmodern Subject* (Notre Dame, IN: University of Notre Dame, 2001) and *By Design: Theology, Ethics and the Practice of Engineering* (Eugene, OR: Cascade Press, 2013). He has published a wide range of journal articles and book chapters, including “Rethinking Fideism through the Lens of Wittgenstein’s Engineering Outlook” (*International Journal for the Philosophy of Religion*).

Gregg Stedronsky
Vice President for Global Engineering,
Safety and Manufacturing Excellence, General Mills

Gregg Stedronsky is the Vice President of Global Engineering, Safety and Manufacturing Excellence for General Mills. In this role he has accountability for capital program execution, technology commercialization, global safety and environmental leadership and continuous improvement. Gregg joined General Mills in 1991 and held a variety of positions in Manufacturing and Engineering including leadership roles in manufacturing plants in Lodi, California and West Chicago, IL. In 2001, Gregg became the Director of Control & Information Systems where he led the development of plant floor information systems. He was named Director of Packaging Engineering in 2004 and took over engineering in 2006. In 2010 he assumed responsibility for global safety and environment and in 2014 added responsibility for global manufacturing excellence. Prior to General Mills Gregg worked for Control Data Corporation in computer development. He received his MBA from the University of Minnesota in Operations Management and his mechanical engineering degree from South Dakota State University. He is married and has three children.

Michael J. Quinn
Dean of the College of Science and Engineering,
Seattle University

Michael J. Quinn is Dean of the College of Science and Engineering. Before joining Seattle University in 2007, he was a professor of computer science at the University of New Hampshire and Oregon State University. He earned a B.S. in mathematics from Gonzaga University, an M.S. in computer sciences from the University of Wisconsin-Madison, and a Ph.D. in computer science from Washington State University. Before undertaking his Ph.D. studies, he worked for two years as a software engineer at Tektronix, Inc. Dr. Quinn did pioneering research in the field of parallel computing that resulted in the publication of more than 60 refereed journal and conference papers. His textbooks on parallel computing have been used by hundreds of universities worldwide. Dr. Quinn is also a leader in the field of computer ethics. His textbook, *Ethics for the Information Age*, explores moral problems related to modern uses of information technology, such as privacy, intellectual property rights, computer security, and software reliability. The book, now in its seventh edition, has been adopted by more than 125 colleges and universities in the United States and many more internationally.
This paper demonstrates how a small military college has integrated an academic program of ethics and leadership across the campus and more specifically within the School of Engineering at The Citadel. The college’s quality enhancement plan titled “Ethics in Action: Since 1842,” provides a unified approach to ethics that spans all undergraduate and graduate level degree programs. This ten year plan, constructed by the faculty and staff, provides a detailed roadmap for improvement of student learning at the institution. It integrates ethics and principled leadership topics into the general curriculum and into specific courses taken by the student body as a requirement for graduation. The paper will outline the leadership course requirements, the inclusion of service learning, and participation of local businesses in the program. To further prepare students for a culture of ethics in engineering the Department of Electrical and Computer Engineering provides additional emphasis throughout the BSEE program. Both in and out of the classroom, these topics span freshman through senior years. Some examples include case studies based on the IEEE and NSPE codes of ethics in the “Introduction to Engineering” course as well as during the capstone senior level design experience. Due in part to the standardization provided by accreditation bodies, many of these topics can be found in most undergraduate electrical engineering programs, including ethical failures leading to some infamous accidents. Additionally, the engineering curriculum is supplemented with panel discussions involving local practicing engineers, sponsored by the student IEEE Chapter. The chapter also sends a team each year to the regional conference, which includes an ethics competition. By taking this broader approach to the study of ethics beyond engineering, The Citadel has a unique story to contribute to the discussion of teaching ethics at the collegiate level.

DOES CULTURAL PLURALISM DEMAND ETHICAL PLURALISM?: TEACHING ENGINEERING ETHICS TO LATINO/A STUDENTS

Thomas D. Pearson
The University of Texas-Rio Grande Valley

One of the more deeply congested issues attending the teaching of engineering ethics in a bi-cultural or multi-cultural context is the question of how to handle cultural pluralism. In many traditional and ethnic communities, does respecting the dynamics of cultural pluralism require the adoption of an ethical pluralism? That is, is it necessary to allow widely varied moral standards (as, say, reflected in an engineering code of ethics) in order to accommodate widely varied cultural practices? At the university where I teach engineering ethics -- one of the largest Hispanic Serving Institutions (HIS) in the country --we don't think so. This paper will discuss the contours of the problem of teaching engineering ethics in a distinctive culturally pluralistic environment, such as our university setting, and two of the strategies that we have employed to avoid the snares of ethical pluralism as we seek to form an ethically responsible professional identity among our engineering students.
The story of ethics at North Dakota State University (NDSU) began in the 1980s when the College of Engineering offered a day-long seminar in engineering professionalism to give seniors some help in dealing with the issues they would encounter in their careers. It continued later when we matched seniors and freshmen in a similar but term-long experience, hoping the interaction would be beneficial to both. Ethics education had been and is ubiquitous in engineering courses as modelled by the ethical behavior of faculty and the emphasis on competent engineering practice. Earlier the College had introduced two courses, one dealing with the history of technology and the other dealing with its social impact. These two courses surveyed the positive impact of technology on human life and the problems that technology creates. Early in the 1990s we introduced a standalone engineering ethics course, taught, initially, by a regular faculty member who had also studied theology. In time these three courses matured and became permanent fixtures in the College. The history and social impact courses became approved general education courses. Experience with these courses has been documented in over a dozen conference papers. All three courses demonstrate the commitment of engineering educators to responsible engineering practice.

SESSION 2: NEW CHALLENGES IN A TECHNOLOGICAL AGE

GLOCALIZATION AND ICT: PRESUPPOSITIONS, TENSIONS, AND ETHICAL POSSIBILITIES

Anne H. King
University of St. Thomas

This essay seeks to address the issues of the conference by considering the difficult question of “glocalization” (how to be global and local) from the viewpoint of the meaning of computer ethics. The paper addresses the question of glocalization, the meaning of ethics for ICT (information and communications technology), and its application to the field, and finally considers the global and the local in tension with one another as a source of possibilities and questions for the future.
NEW ETHICAL CHALLENGES IN BIG DATA SOFTWARE PROJECTS

Frank S. Haug
Graduate Programs in Software, School of Engineering,
University of St. Thomas

Ethical challenges are an expected part of many software systems, especially systems that process personal and confidential information. The teams of software engineers and data scientists who build these systems use a combination of technologies and human practices (such as, encryption, HIPAA, and HL7) to guard against certain types of unethical data abuse. For example, healthcare systems strive to ensure patient privacy, while preventing medical fraud and identity theft. Experienced teams recognize that the software implementations (and these protections) are imperfect—there is no substitute for morally responsible behavior. However, new types of software systems, called “Big Data” systems, introduce additional ethical challenges. The size, complexity, and rapidly evolving technologies used in Big Data systems can render the current safeguards inadequate. For example, we used to assume that removing identifying information (such as a person’s name and social security number) would effectively render a data set “anonymous”. Because of Big Data techniques, this is no longer sufficient protection. Powerful hardware, sophisticated algorithms, and massive amounts of data can “re-identify” this data (re-exposing it to potential abuse). This presentation, will highlight the new challenges found due to Big Data, provide example scenarios, and discuss the ethical issues and possible solutions.

EMBODYING PROGRESS?: SKILL, DEVELOPMENT, AND TECHNOLOGICAL DESIGN

Dustin Studelska
University of Minnesota, Program in the History of Science, Technology, and Medicine

Recent research in the fields of cognitive science, philosophy of the mind, and anthropology has indicated that physical engagement with material objects plays an extremely important role in the development of the human mental faculties, over generations and over an individual’s lifetime. In becoming engaged with specific material processes, like weaving for example, individuals gain experience and skills that help to develop their cognitive capacities to successfully deal with life around them. In light of such research, this paper asks: how are we to reconcile the possibility of ethical design of technology that encourages human development with the frequent and traditional imperative that new technologies be convenient and labor-saving, and as a result, contribute to the de-skilling of the general workforce? While utility, ease of use, cost-effectiveness, and efficiency will no doubt continue to be basic parameters that drive technological design, might a concern for the developmental experience of the user, beyond safety and productive capacity, also weigh on designs in the future? Using various perspectives from the history of technology regarding the historical importance of embodied knowledge, the de-skilling of workers via industrial machinery, and the enlightenment ideology of progress being inherent in the technical arts, I hope to initiate a discussion on what is lost when engineers and designers are instructed to abstract the human element from technological design.
SESSION 3: VOCATION, VIRTUE, AND CREATION STEWARDSHIP

VOCATION LEADING INTO VIRTUE ENGINEERING ETHICS

William Jordan
Mechanical Engineering Professor at Baylor University

Many approaches to engineering ethics look at such things as engineering codes of conduct and how/why engineers should obey them. However, these approaches are inadequate for they do not deal with intrinsic motivations. If an engineer only does what she has to do to obey the codes, then there is the temptation to do the bare minimum required. This paper looks at the question of vocation and how that can lead to the development of a robust Christian virtue engineering ethics perspective. The concept of vocation has been largely lost in our modern culture. Many people think it only means a career in full time Christian ministry or an education obtained at a vocational/technical school. However, vocation for the Christian engineer should mean much more. Following our calling should lead to us becoming a better person. Becoming a better person is at the heart of a virtue ethics approach to engineering. Someone who follows a virtue engineering ethics perspective will, in most cases, also be following the engineering codes. However, by having an intrinsic motivation to behave ethically, this engineer will not do only the bare minimum, but strive to be the best possible engineer.

VIRTUE IS ITS OWN REWARD: IS ETHICS ENOUGH?

Mark J. Summe
University of Notre Dame

Being an ethical scientist should not be applauded; it is required. As Christians, we must expect more. What we need are virtuous scientists. It is not enough for the Christian to merely avoid evil. It is not even sufficient to do good. We are called to be perfect as our heavenly Father is perfect, which means doing good for the right reasons. Ethics has come a long way since Aristotle, which he defined as “character excellence.” Today, particularly in science, ethics leans more toward “character expectations.” Recent studies imply that “ethics in science” has a negative connotation. This is easy to understand, as ethics is often seen as rules of unacceptable behavior to be avoided, emphasizing strongly what you cannot and/or should not do. I offer a critique on the existing motivations for avoiding bad research practices and practical suggestions for researching, teaching, and studying virtuously. This exhortation to live virtuously is reiterated in Christian resources, such as the Bible, John Paul II’s encyclical Veritatis Splendor, and works from C.S. Lewis and Peter Kreeft. They instruct us to put first things first; our intention is just as important as our actions.
CHRISTIANITY, CROSSING CULTURES, AND CREATION STEWARDSHIP: A CASE STUDY FROM GUATEMALA

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This paper presents a case study from Guatemala in which a group of North American engineers and engineering students assisted a locally-led Christian school in the design of a major school expansion. This endeavor involved specific ethical tensions regarding creation stewardship which the team addressed with sensitivity to cultural differences through the mutual lens of biblical scripture. The ethical tension centered around the school's wastewater design, and existed due to three factors: (1) the common practice in the area of dumping raw sewage into the nearby river, (2) the major educational gap in Guatemala between the number of school-age children and the capacity of existing schools, and (3) balancing the available land area to locate educational buildings with area also needed to treat and dispose of wastewater on site. This case study presents how this group from differing cultural backgrounds worked together to balance the need to drastically increase school facilities to meet the current population with the call to exercise stewardship of creation, mainly by not contributing to the contamination of existing fresh water in a country with limited regulatory structures and insufficient public resources to adequately treat such water for safe usage by its population.

SESSION 4: MAKING DECISIONS: ENGINEERING REASONING AND TRANSPORTATION PLANNING

ETHICS AND UNCERTAINTY IN ENGINEERING

Bill Bulleit
Professor of Civil and Environmental Engineering
Michigan Tech, Houghton, MI 49931 • Tel: 906-487-2853 / Email: wmbullei@mtu.edu

Engineering requires decisions under uncertainty. Uncertainty is a function of ignorance, inherent variability, and complexity. Knowing whether a decision is ethical or not is much more difficult under uncertainty. This presentation examines the effects of uncertainty on ethical decisions and considers a broader view of engineering, referred to here as the Engineering Way of Thinking (EWT), that may help in making ethical decisions under uncertainty. With apologies to the philosopher Wilfrid Sellars, the EWT is a means to approach design, in the broadest possible sense of the term, using heuristics, in the broadest possible sense of the term, to develop artifacts, in the broadest possible sense of the term. In this sense, artifacts are anything that humans make, and if we make something, there should be a design for it before it is made. It is the concept of designing and making artifacts under significant uncertainty using heuristics that makes the EWT an approach that has broad application across the culture. Ethical decisions become problematic when there is uncertainty about the future, and the decisions being made affect the future, but so do other events that are out of the control of the designer, and some of those events may be a function of the artifact. Thus, an apparently ethical decision made today may prove to no longer be considered ethical sometime in the future, and the reason it appears unethical may be due to the earlier ethical decision. The EWT is a process that can help in making ethical decisions under these kinds of conditions.
Charles Sanders Peirce, the founder of pragmatism, identified three stages in the “logic of inquiry” commonly employed by scientists: abduction, deduction, and induction. He further held that all deductive reasoning is diagrammatic; i.e., it proceeds by constructing, manipulating, and observing a representation that embodies the significant formal relations of its object. The thought process commonly employed by engineers is a “logic of ingenuity” with a similar structure: (abductively) creating a model of a problem and its proposed solution, and then (deductively) working out the necessary consequences, such that this serves as an adequate substitute for (inductively) evaluating the actual situation. Furthermore, while science is perceived as an especially systematic way of knowing, engineering could be conceived as an especially systematic way of willing. Consequently, its distinctive form of reasoning should be paradigmatic for making decisions of any kind and then acting upon them; i.e., for ethical deliberation. The key to success is having the ability to discern the significant aspects of reality and consistently capture them, before definitively selecting a way forward from among multiple viable options. The logic of ingenuity is thus a carefully cultivated habit that facilitates imagining possibilities, assessing alternatives, and choosing one of them to implement—not only in engineering, but in any endeavor.

THE PEÑALOSA PRINCIPLE OF TRANSPORTATION DEMOCRACY

Shane Epting
University of Nevada, Las Vegas

People who use transit systems often lack meaningful ways to help develop or improve them. Residents require this ability because of the effects that transportation has on their health, livelihoods, and ability to economically advance. Decisions about transportation systems also carry significant weight for the community, involving public land, natural resources, and funding schemes that allocate hundreds of millions of dollars. Due to the high-stakes of such decisions, I argue that municipal leaders have a responsibility of moral a nature to implement resident-centered democratic practices that can shape transit systems, from the initial planning stages to adjustments in daily operations. To make this case, I examine the kinds of harm that different transportation infrastructures cause through their relationships with the political, social, topographical, and technological elements that surround them. Through understanding the complex nature of such harm, I make a case showing why this area demands increased democratic action, illustrating how the transit planning of Enrique Peñalosa, the current mayor of Bogotá, provides a way forward. I call his position “The Peñalosa Principle of Transportation Democracy,” and unpacking it reveals how it can serve as a heuristic for developing just, democratic transportation infrastructure.
Many engineering ethics courses include instruction on ethical reasoning, using a variety of approaches. This variety prompts several questions: Are some approaches to ethical reasoning more effective, either as a teaching tool or as a decision guide in the workplace? Are some argument frameworks more accessible to an engineering outlook? In addition to emphasizing logical rigor, do some approaches to argument allow for greater ethical sensitivity? Do some argument frameworks facilitate the inclusion of resources in Christian faith and theology in engineers’ arguments? This presentation will address these questions by approaching the question of comparative argument frameworks as a question of engineering design: Namely, what constitutes a good design for an argument framework in engineering ethics? To explore this question in a concrete way, this presentation will focus on the “candid layout” model of practical reasoning provided by philosopher Stephen Toulmin. It will draw from actual classroom examples, as well as from the literature on effective design, to identify particular strengths, and shortcomings, of Toulmin’s approach.

Discussions of the ethics of the engineering enterprise in work organizations have often related it to issues of “character”, mainly by adopting two different conceptions of the term. The first conceives character as an individual capacity to practice the virtues (such as honesty, objectivity, a concern for the common good) that allow the engineer to fulfill her key responsibilities to clients, employer and the general public. From the second, more critical, perspective the figure of the engineer is assimilated with that of the Manager as an emblematic character of our society, representing the triumph of technicism with its associated risk of moral indifference. This presentation suggests an alternative way for looking - constructively - at the moral relevance of engineers’ action, which focuses directly on the level of organizational life. Taking inspiration from some ideas of the American sociologist Philip Selznick, character is seen as an attribute of the organization as such and refers to organizational identity: a collective sense of “who we are” and “what our style of doing things is” that reflects the core values and commitments - including moral ones - incorporated into the organization through its evolution and the exercise of its distinctive competence. In this light, there is significant room for understanding and promoting the role of engineers in those processes that sustain an organization’s moral character, in two key senses: first, as interpreters facilitating mutual translation between their technical know-how and organizational shared values; secondly, as change leaders stimulating paths of experimentation or innovation that extend an organization’s ethical culture and commitment to social responsibility in front of contextual challenges.
GOOD ETHICAL PRACTICE IS GOOD BUSINESS PRACTICE

Committee on Ethical Practice
American Society of Civil Engineers (ASCE)

This Presentation will address Ethics from a “Business Perspective”. It will discuss: 1. ASCE’s Code of Ethics and how it impacts the Civil Engineering industry; How “Ethical Behavior” is good for business and adversely how “Unethical Behavior” can negatively impact a company’s bottom line; 3. Practical Ethical Case Studies in the Civil Engineering industry and lessons learned. The presentation begins with an overview of ASCE’s Code of Ethics and how the Code applies to its 150,000 members in the USA and in other countries. It will discuss proposed changes to the Code and the reasons the changes are being considered. Following the “Code of Ethics” overview, “Ethical” and “Non-ethical Behavior” will be discussed. The focus will be on how the behavior impacts companies’ financial performance. Real life examples will be discussed from companies in a variety of disciplines. Finally, case studies will be discussed. These case studies will demonstrate common Ethical situations faced by Civil Engineers in their daily lives. The Learning Objectives of the Presentation are: 1. Learn how ASCE’s Code of ethics applies to its 150,000 members; 2. Identify at least 3 lessons learned from Companies which “Behave Ethically”; 3. Identify at least 2 improvements that participants can implement in their companies to enhance “Ethical Behavior.”

SESSION 6: EXPANDING THE DISCUSSION: TECHNOLOGY AS A MORAL AND THEOLOGICAL ISSUE

NATURAL OR UNNATURAL?: THE BIOENGINEERING QUESTION THAT NATURAL LAW CAN’T ANSWER

Thomas D. Pearson
The University of Texas-Rio Grande Valley

Natural Law theory is perhaps the oldest enduring proposal for ethics in western civilization. Its intent is to articulate a “higher law” that expresses a set of fundamental human (and, occasionally, non-human) values, or basic human goods, that may not be violated under normal circumstances. However, all of this depends, in part, on a clear delineation of what counts as “natural.” With advances over the past century in technology, and in particular, with recent developments in bioengineering, it is gradually becoming more problematic to distinguish these categories, and confidently to identify that which belongs to the “natural.” This paper will, in a preliminary way, explore the growing impact of bioengineering on the ethical viability of Natural Law, examine the difficulties Natural Law theorists may have in coping with the potential blurring of the lines around the “natural,” and suggest a possible way such theorists might be able to reconceptualize Natural Law to accommodate the advances in bioengineering.
DENYING ENGINEERS AN ETHICAL VOICE: THE MANHATTAN PROJECT AND THE MORAL FAILURE OF CURRENT DIALOGUES ON RELIGION AND SCIENCE

Jennifer Karns Alexander
University of Minnesota

The Manhattan Project produced the world’s first atomic weapons, and the moral value of those weapons is contested to this day. Yet the many and indispensable engineers who brought the project to material fruition have seldom been asked their moral opinions of their work, despite great public interest in the moral reactions of the numerous scientists involved. Consider for example the classic film about the Manhattan Project, /The Day After Trinity/. It is often shown in engineering ethics courses, and it includes anguished interviews with physicists, chemists, and mathematicians, such as J. Robert Oppenheimer and Stanislaw Ulam. It includes no interviews with engineers. This pattern has been repeated whenever the ethics of nuclear weapons has been discussed: Manhattan Project scientists have been allowed to be morally vexed, but Manhattan Project engineers have not. Using the Manhattan Project as a case study, this paper argues that the America post-war emphasis on science as neutral and fundamental has systematically denied engineers a public and moral voice, and that theological investigations of technology have perpetuated this muzzling of engineers, by themselves concentrating on technology as a form of applied science, and by thus treating technology as a question of knowledge rather than practice. The paper concludes with a call to extend an emerging and promising dialogue within theology that treats technology—and not just science—as a moral issue.

CHRISTIANITY AND TECHNOLOGICAL PROGRESS: PAST, PRESENT, AND FUTURE

Brian Patrick Green
School of Engineering and Markkula Center for Applied Ethics, Santa Clara University

Historically, Christians have done immense work towards advancing science and technology. Indeed, many aspects of the Christian worldview form the basis for scientific and technological progress. And yet the connections between Christianity and technology have not been deeply explored, indeed, there are only the beginnings of what could be called theology of technology. In this paper I will look at the past, present, and future of the relationship of Christianity and technology, and argue that technological development is integral to Christianity. I will argue that Christians should re-emphasize their own tradition of technological optimism and scientific and technological development for the sake of helping others. Furthermore, I will argue that Catholic social teaching (from Rerum Novarum through Laudato Si) argues this too. Ultimately, as Pope Francis notes in Laudato Si, we need better people, morally speaking, not only better technology. But a truly prudent “morally better person” would use the best means available, including the best technology - existing or awaiting invention - to maximize their beneficial impact on the world. We are the ones called to this task. How shall we respond?
SESSION 7: MAKING A DIFFERENCE: ENGINEERING FOR THE COMMON GOOD

WORKING TOWARDS THE COMMON GOOD
WITH THE DEVELOPMENT OF A NEW TECHNOLOGY

Thomas Pratt
University of Notre Dame

This paper describes the experiences of the author associated with the development of a new technology and efforts towards translation of that technology. As a member of the research faculty at the University of Notre Dame, a goal of the author has been to engage in research to develop technologies that will serve the common good. This goal fits within the overarching mission of the College of Engineering: “Consistent with the University’s Catholic mission and heritage, the College of Engineering’s mission is founded on the principle that the creation and transfer of knowledge should reflect a profound and complete respect for the dignity of all persons and for the greater common good of humanity.” In 2005/2006, research conducted by the author led to the observation of a little-known (or perhaps unknown) radio frequency signal propagation phenomenon. The observation was followed by efforts over the next several years to identify potential ways to exploit the phenomenon, particularly in areas familiar to the author such as radar, communications, and non-contact sensing. Following a series of patent applications, efforts have been undertaken to pursue collaborations with industry to enable translation of the technology into candidate fields of use. The challenge has been to find companies and/or investors who are willing to commit their assets to evaluate and build a product around the technology, particularly given the “technology readiness level” that our work has been able to achieve to date. This has required a great deal of investment in time to explain and demonstrate the technology to potential industry partners. It has been made even more difficult since the underlying technology is not widely known or understood, even by those who practice in areas associated with radio frequency systems. The efforts have resulted in positive outcomes. Multiple industry partners are beginning to engage with the University of Notre Dame, and the first stages of translation appear to be imminent.

THE ENGINEERING ETHICS OF LAUDATO SI’

Andrew K. Henrick, PhD
University of Dayton

Pope Francis’ encyclical Laudato Si’ demands an authentic university foundation to Catholic engineering education. At the core of this pedagogical effort is a shift from engineering as specialized, technical competency to engineering as a moral act. This holistic understanding of engineering entails that it is experiential, integrated, and progressive. These three pillars form an ecological framework structurally informing engineering and engineering education. “Developing the created world in a prudent way is the best way of caring for it, as this means that we ourselves become the instrument used by God to bring out the potential which he himself inscribed in things…. (LS 124)” Taking this quote as our point of departure, Pope Francis’s articulation of the engineering vocation is anthropological; its magnificence lies in co-creating with God, in unfolding the potential already inchoate in nature. Far from denigrating science and engineering, Francis’s appeal is for engineers capable of genuine discernment, clarifying not just the amazing connections between an artifact and its environment but also progressively revealing that artifact as a sustained dimension of creation. Thus understood, engineering is freed from preoccupations of technocracy and consumerism to refocus on the common good.
GLOBAL PEACE THROUGH PERSONAL INNOVATION

Bridget M. Carey
University of St Thomas

Peace engineering, or humanitarian engineering, is the next great and necessary step in our profession. It steps up to the range of humanity’s challenges - from survival needs, to emergency shelters, and reaching to technological advances for peacekeeping - by working across disciplines to collaborate better for and with people than ever before. However, much of the service done by peace engineers is not seen or heard by the general public, since it is not the next awesome gadget. For attendees of Global Peace through Personal Innovation, organizations and academic programs from around the globe that are striving toward the common good will be presented. Organizations include non-profits, NGOs, and specialized departments of many professional networks. Academic programs include a growing number of unique undergraduate and graduate programs rich in opportunities for engineers to start their passions early. Such work deserves to become more widely known by those who will appreciate it and promote its continuation. The organizations will come from varying fields of interest, and the programs will contribute different goals and pedagogies, but all of them participate in the next step forward for engineering’s impact on the world.

SESSION 8: THE PRACTICE OF ETHICS: DEVELOPING VIRTUE THROUGH SMALL CHOICES

THE EVOLUTION OF ENGINEERING ETHICAL LAPSES

Michael Dorin
University of St. Thomas

Parkinson’s law states that “work expands so as to fill the time available for its completion”. Expanding this axiom, “Ethical indiscretions will expand to fill established boundaries”. This presentation will explore ethical challenges from the beginning of embedded software to our present connected generation. Grand scale ethical violations such as the Volkswagen scandal are widely publicized and substantial debate occurs analyzing how and why such things happen. As a Software Engineer and Instructor for 30 years, I have been witness to many engineers ‘bending the rules’. As more resources have become publically and easily available, it has become easier to use the work of others inappropriately. It is my opinion that large ethical violations are built upon a foundation of smaller ones. This material was constructed through reviewing historical and ongoing publicized events as well interviewing experienced engineers and senior educators to create a collection of lapses. This presentation will present examples of ethical violations performed in the early years of embedded software demonstrating the evolution to our modern world. Both academia and industry will be examined and considerations of the ramifications for individuals and organizations will be offered. Finally, procedures and policies employers have implemented to encourage ethical behavior and discourage even small infractions will be shown.
Modern philosophy recognizes two major ethical theories: deontology, which encourages adherence to rules and fulfillment of duties or obligations; and consequentialism, which evaluates morally significant actions strictly on the basis of their actual or anticipated outcomes. A third option, prominent in ancient philosophy, has reemerged recently: virtue ethics, which recognizes that sensitivity to context and practical judgment are indispensable in particular concrete situations, and therefore focuses on the person who acts rather than the action itself. Such an approach identifies beneficial character traits—i.e., virtues—within a specific social practice in light of the internal goods that are unique to it. This presentation proposes the following framework for implementing virtue ethics within engineering: Virtuous Engineers assert their responsibility for engaging in a combined human performance that involves the exercise of practical judgment to enhance the material well-being of all people by achieving safety, sustainability, and efficiency while exhibiting objectivity, care and honesty in assessing, managing, and communicating risk. Conceptualizing engineering ethics along these lines treats it as something that is integral to practice, rather than supplemental—if you are an engineer, then your practice IS your ethics! However, some of the details remain unsettled, and this session provides an opportunity to discuss them.

FAITH AND ENGINEERING EDUCATION

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The objective of the proposed paper will be to find out if there is justification for a faith-based engineering program using results of a survey of engineering students of Andrews University, Berrien Springs, Michigan, U.S.A.; biblical, Christian and secular sources. Cogent examples to show that engineering is God’s idea will be reviewed. It will be instructive to find out why engineering students are desirous of attending a Christian institution such as Andrews University in particular. It will be argued that in order to effectively combat corruption - a moral issue - the training of engineers in faith-based institutions will go a long way in meeting this goal. From the findings conclusions should be drawn as to whether a faith-based engineering program at undergraduate and graduate levels is justified. The paper will also attempt to recommend what further studies are needed to be carried out on a continuous basis to investigate whether the conclusions can be sustained and to compare engineering alumni from faith-based engineering institutions to those from secular ones. Also needing investigation is the extent to which faith has influenced the philosophy of engineering education. In particular, what role should the philosophical dimension of logic play in the formulation of faith-based educational concepts and the design of the curriculum? To what extent should ethical and epistemological dimensions aid in the formulation of the theory of engineering education in a faith-based institution?
A CASE FOR INNOVATION THEOLOGY

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Does God have anything to do with innovation? Does innovation have anything to do with God? Our answers reveal our implicit innovation theology. Innovation theology informs the choices we make at the intersection of discovery, invention, value and God – where innovations are needed, why and for whom. Not to be confused with workplace spirituality, business ethics, or moral criticisms of technology, innovation theology reframes change as an envelope with an invitation from God to create new value for others (i.e., to innovate). Innovation theology challenges our technological innovation efforts to be more aligned with the purposes of God, instead of blindly obedient to the market’s invisible hand. (Do we really need another app to enable another advertising platform?) Innovating engineers who make meaning before money, align bottom lines with plumb lines (Amos 7.7), re-attach extrinsic to intrinsic value, and serve the common good more than the convenience of consumers, may be closer to innovating in the company of God. What if theologically curious engineers, designers, scientists, economists, entrepreneurs, investors and innovators were to collaborate in explicitly charting this tacit domain? Might transformative innovations for the common good be a result? How such conversations can be conducted and what might be discussed is presented.

SESSION 10: TEACHING ENGINEERING ETHICS

“IF YOU WON’T DO IT, I’LL FIND SOMEONE ELSE WHO CAN”:
ENGAGING ENGINEERING STUDENTS IN ETHICS THROUGH THEIR OWN CO-OP STORIES

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Engineering students on co-op and internships sometimes confront serious ethical challenges, particularly through non-engineering supervisors who themselves are under financial pressure. Are we adequately preparing our students to have crucial conversations about the health, safety, and welfare of the public? Students who have returned from work positions testing, designing, and documenting technologies sometimes report high-pressure situations where they felt they were being asked to choose between their own job security (or the company’s profits) and “doing the right thing.” If they need their jobs to pay for school, they may do whatever is necessary to stay employed. Their undergraduate education should help prepare them for the complex pressures, uncertainties, and ambiguities they may confront on the job. Sharing their ethics-at-work stories can help them build their courage to stand their ground. I will discuss an assignment we use with undergraduate engineering students that gives them a safe space to discuss the ethical dilemmas they have encountered at work. Through story-telling and an ethical decision-making model, they present different options to the class and facilitate a discussion. I will share a few sample cases students have developed and discuss the benefits and challenges of teaching and assessing this assignment.
Ethics in engineering is acknowledged as very important to come to responsible research and innovation (Owen et al., 2012). This holds if ethics courses are effective. Ethics courses therefore should engage students efficiently in acquiring a social responsible engineering attitude for their future careers. To answer this challenge, the Eindhoven University of Technology USE basic course for 2000 students was redesigned using the self-determination motivation theory. This theory states that three basic needs largely determine a person’s motivation: autonomy, relatedness, and competence. The results show that the redesign of the course increased students’ effort, but did not yet succeed in increasing students’ motivation and perception of course relevance. A lack of relevant challenge seems one of the important factors for this outcome. In order to engage students further in acquiring a future responsible engineering attitude, the USE basic course will have to be more relevant for them. Focus group research will be employed in the near future to explore students’ need for challenge further.