An NSF/Bovay Endowment Supported Workshop to Develop Numerical Problems Associated with Ethics Cases for Use in Required Undergraduate Engineering Courses

Professor Michael J. Rabins
Director of the Ethics and Professionalism Program in the College of Engineering,
Professor C. Edwin Harris, Jr.
Associate Head of Department of Philosophy
Jeremy E. Hanzlik
Bovay Fellowship Student
Texas A&M University

In August of 1995 thirty-five faculty from around the nation, supported by the National Science Foundation, joined eight undergraduate fellows, supported by the Harry E. Bovay, Jr. Ethics Endowment, for a one-week workshop on the campus of Texas A&M University to achieve an innovative goal. That goal was to develop engineering ethics resource material that could be easily introduced at all levels of the engineering curriculum and in all engineering disciplines. To accomplish this task, it was decided that the development of a new set of engineering ethics cases which would include numerical problems would be the best course of action. The numerical and ethical problems based on these new cases could then find a niche in many required undergraduate engineering courses as home-work problems, quiz problems or lecture demonstration problems. The presentation which this paper summarizes covers the approach adopted and results achieved at the workshop. The thirty-six faculty participants (including a visitor from Mexico) are listed alphabetically in Figure 1, along with their affiliations and e-mail addresses. All of the participants from this workshop are dedicated to helping you use these cases as effectively as possible. You should feel free to contact the case authors. They are prepared to respond to any e-mail queries.

The eight Bovay Undergraduate Fellows who worked alongside the faculty participants are also listed. These Bovay Fellows were students who had earned an A in the Engineering Ethics course at Texas A&M University, and who had a high engineering grade point average. The students not only provided reactions to the case problems, but also contributed some excellent cases themselves.

The participants were lead by group discussion leaders (facilitators): Mark Holtzapple, Lee Lowery, John Tyler and Alan Letton (Dr. Letton is now the Dean of Engineering at the Tuskegee Institute). These leaders have worked with ethics cases and are experienced faculty members at Texas A&M.

During the workshop, Professor Lee Lowery delivered a presentation of one of his cases on the World Wide Web (WWW). By popular demand, he gave an intensive short course which detailed the creation of WWW files. These presentations helped to set the course towards the final product. The last abstract of this report summarizes the ASEE Mini-Plenary presentation on the WWW.

The approaches of the four groups in selecting appropriate cases were somewhat different, although each group tended to operate in a similar manner. The groups talked through the candidate cases and came to consensus decisions regarding which cases to pursue. They then divided into small working teams to create each case and the associated problems. Since the close of the workshop, the cases have been reviewed, edited, approved by the authors and placed on the WWW. Not all submitted cases could be used in the final product and report to the NSF. In order for a case to be used it had to meet the following criteria: widely useable in an

engineering curriculum; engineering solution provided; clearly relevant ethical issues raised; ethical discussion provided; ethical issues self-explanatory without reference to an engineering ethics textbook.

Following Figure 1 are tables I through IV which summarize the Chemical, Civil, Electrical and Mechanical Engineering cases. Each table provides the title of the case, the lead author to contact for further information, the courses in which the problems could be productively used, and the level(s) in a four-year curriculum for which the case and problems are appropriate.

Following the tables, there are five abstracts of the mini-plenary presentations. Each presentation focused on a case representative of cases from that group. The associated numerical problems, and ethical issue(s) were discussed in sufficient detail to demonstrate how to productively use the case in a class.

Figure 1: Participants at the August, 1995 NSF/Bovay Engineering Ethics Workshop

Akujuobi, Cajetan M. - Norfolk State University
akujuobi@vger.nsu.edu
Barron, Ottis L. - U. of Tennessee at Martin
obarron@utm.edu
Borns, John A. - University of Toledo
74357,1252@compuserve.com
Burkett, Susan L. - University of Alabama
sburkett@coe.eng.ua.edu
Busot, J. Carlos - University of South Florida
busot@eng.usf.edu
Deivanayagam, Subramaniam - Tenn. Tech. U.
sd6108@tntech.edu
Fletcher, David Q. - University of the Pacific
dfletcher@vms1.uop.edu
Glagola, Charles - University of Florida
cglag@ce.ufl.edu
Hamid, Michael - University of South Alabama
mhamid@jaguar1.usouthal.edu
Helmer, Wayne A. - Southern Illinois University
helmer@engr.siu.edu
Johnston, Roy C. - McNeese State University
rjohn@engr.msu.edu
Jordan, William M. - Louisiana Tech University
jordan@engr.latech.edu
Latcha, Michael - Oakland University
latcha@oakland.edu
Layton, Jeffrey - Clarkson University
laytonj@sun.soe.clarkson.edu
Mahaffey, Derek W. - Cogswell College North
ccn-eecs@ccn.edu
Morgan, James O. - Prairie View A&M University
jmorgan@pvcea.pvamu.edu
Olson, L. Howard - Georgia Tech
howard.olson@textiles.gatech.edu
Price, Randel M. - University of Mississippi
cmprice@sunset.backbone.olemiss.edu
Reis, John C. - Embry-Riddle Aeronautical U.
reis@moon.pr.erau.edu
Rodriguez, Jose de Jesus - ITESM
jjrodrig@campus.mty.itesm.mx
Roth, Waldo - Taylor University
wlroth@tayloru.edu
Tsang, Edmund - University of South Alabama
etsang@jaguarl.usouthal.edu
Veshosky, David A. - Lafayette College
veshoskd@lafayette.edu
Voshall, Roy - Gannon University
voshall@cluster.gannon.edu
Ward, Thomas L. - University of Louisville
tlward01@homer.louisville.edu
White, Charles V. - GMI Engineering & Mgt. Inst.
cvwhite@beretta.gmi.edu
Wick, Timothy M. - Georgia Institute of Tech.
timothy.wick@che.gatech.edu
Wujek, Joseph H. - University of California
wuj@eecs.berkeley.edu
Yannitell, Daniel W. - Louisiana State University
meyann@imr00.me.lsu.edu

Co-Directors
Harris, Charles E. - Texas A&M University
e-harris@philosophy.tamu.edu
Rabins, Michael - Texas A&M University
m1r6609@acs.tamu.edu

Presenter
Pritchard, Michael - Western Michigan University
michael.pritchard@wmich.edu

Facilitators
Holtzapple, Mark - Texas A&M University
mth4500@chennov1.tamu.edu
Letton, Alan - Tuskegee University
aletton@acd.tusk.edu
Lowery, Lee - Texas A&M University
lowery@tamu.edu
Tyler, John - Texas A&M University
tyler@ee.tamu.edu

Bovay Student Fellows
Hanzlik, Jeremy E. - Texas A&M University
Loe, Greg - Texas A&M University
Shumbera, John A. - Texas A&M University
Stormer, James D. - Texas A&M University
Swoboda, Jason Edward - Texas A&M University
Trahan, Nicole - Texas A&M University
Walker, Robert C. - Texas A&M University
Wilhelmsen, A. Ryan - Texas A&M University

TABLE I
Cases Compiled by the Chemical and Process Engineering Group

1. "Superphosphates"
Carlos Busot
Suggested Courses: Mass and Energy Balances, Fluids
Level: 2, 3

2. "The Case of COMRAD Support"
Subramaniam Deivanayagam
Suggested Courses: Design, Safety
Level: 2, 3, 4

3. "Cotton Gin Dust Abatement"
John Shumbera
Suggested Courses: Agricultural Engineering, Environmental Engineering
Level: 2, 3, 4

4. "Marginal Environmental Returns"
Jason Swoboda
Suggested Courses: Mass and Energy Balances, Thermodynamics
Level: 2, 3

5. "The Case of the Exploding Beer Keg"
Roy Johnston
Suggested Courses: Mass and Energy Balances, Thermodynamics, Design
Level: 2, 3, 4

6. "Chateau La Bomb"
Tim Wick
Suggested Courses: Mass and Energy Balances, Thermodynamics
Level: 2, 3, 4

7. "Hydrocracker Separation Drums"
Randel Price
Suggested Courses: Process Control
Level: 3, 4

8. "Past Errors, Present Guilt"
Randel Price
Suggested Courses: Transport, Environmental Engineering, Engineering Ethics
Level: 3

9. "Fabric for a Pressure Suit"
Howard Olson
Suggested Courses: Statics
Level: 1

10. "Numerical Problems for Gilbane Gold"
Mark Holtzapple
Suggested Courses: Environmental Engineering, Mass and Energy Balances, Engineering Ethics
Level: 2, 3, 4

TABLE II
Cases Compiled by the Civil Engineering Group

1. "Parking Structure Foundation"
David Fletcher
Suggested Courses: Reinforced Concrete Design
Level: 4

2. "Failure of a Chair"
David Fletcher
Suggested Courses: Strength of Materials, Stress Analysis
Level: 3, 4

3. "Weston Wastewater Treatment Case"
David Veshosky
Suggested Courses: Wastewater Engineering
Level: 4

4. "Contract, Contract, Who Gets the Contract?"
Charles White
Suggested Courses: Construction Methods Management
Level: 3, 4

5. "Scaling up for Greater Profit"
Charles White
Suggested Courses: Strength of Materials, Stress Analysis
Level: 3, 4

6. "The 30,000 Gallon Tank that Bobbed Up"
Charles White
Suggested Courses: Strength of Materials, Steel Design
Level: 3, 4

7. "Truck Well Geometry"
John Borns
Suggested Courses: Transportation Design
Level: 3

8. "The Sinking Tower"
Borns, Fletcher, & Veshosky
Suggested Courses: Soils, Capstone Design
Level: 3, 4

TABLE III
Case Compiled by the Electrical Engineering Group

1. "Computer Encryption"
Jeremy Hanzlik
Suggested Courses: Computer Science
Level: 1, 2, 3, 4

2. "Defective Chips"
Jeremy Hanzlik
Suggested Courses: Intro to Engineering
Level: 1

3. "Control Design"
Ottis Barron
Suggested Courses: Digital Design
Level: 2, 3

4. "Calculator Display"
Wally Roth
Suggested Courses: Intro to Engineering, Computer Science
Level: 1

5. "PCs and Health Issues"
Wally Roth
Suggested Courses: Intro to Engineering, Computer Science
Level: 1, 2, 3

6. "Military Weapons"
Wally Roth
Suggested Courses: All Engineering
Level: 3, 4

7. "Bad Buffalo Chip"
Wally Roth
Suggested Courses: Computer Arch.
Level: 2, 3, 4

8. "Database Discredited"
Wally Roth
Suggested Courses: Computer Science
Level: 1, 2, 3, 4

9. "Missile Explosion"
Derek Mahaffey
(Susan Burkett and John Tyler)
Suggested Courses: Physics II, E-M I
Level: 1, 2

10. "Hazardous Gases"
Susan Burkett
(Derek Mahaffey and John Tyler)
Suggested Courses: Phys I, Chem I
Level: 1

11. "Cellular Phones"
Michael Hamid
(Nicole Trahan and Jose de Jesus Rodriguez)
Suggested Courses: Antenna Thy/Des
Level: 4

12. "High Voltage Lines"
Michael Hamid
(Nicole Trahan and Jose de Jesus Rodriguez)
Suggested Courses: Antenna Thy/Des
Level: 3

13. "Challenger O-Ring Data Analysis"
Joseph Wujek
Suggested Courses: Intro Engr
Level: 1, 2, 3, 4

14. "Underbidding the Job"
Joseph Wujek
Suggested Courses: Intro Engr
Level: 2, 3, 4

15. "The 100 Year Flood"
Joseph Wujek
Suggested Courses: Intro Engr
Level: 1, 2, 3, 4

16. "Product Reliability"
Joseph Wujek
Suggested Courses: Circuit, chip design
Level: 3, 4

17. "Software Testing"
Joseph Wujek
Suggested Courses: All Design
Level: 3, 4

18. "Circuit Protection"
Roy Voshall
Suggested Courses: Circuit Design
Level: 3, 4

19. "TV Station Reliability"
Cajetan Akujuobi
Suggested Courses: Circuit Design
Level: 3, 4

20. "Toaster Short Circuit"
Roy Voshall
Suggested Courses: Circuits I
Level: 2

TABLE IV
Cases Compiled by the Mechanical Engineering Group

1. "Nuclear Plant Heat Exchanger Problems"
Ryan Wilhelmsen
Suggested Courses: Thermodynamics, Heat Transfer
Level: 3, 4

2. "To Ship or not to Ship"
William Jordan & Michael Latcha
Suggested Courses: Strength of Materials, Engineering Statistics, Materials Properties
Level: 2, 3, 4

3. "Specifications for a Conflict"
Michael Latcha & William Jordan
Suggested Courses: Mechanical Design, Materials Properties, Strength of Materials
Level: 2, 3, 4

4. "Light Duty Step Ladder"
D.Y. Yannitell
Suggested Courses: Mech. of Materials
Level: 2, 3

5. "How far Should the Design Go?"
Jeffrey Layton
Suggested Courses: Strength of Materials, Mechanical Design
Level: 2, 3, 4

6. "Plumbing for Mobile Homes"
John Reis
Suggested Courses: Strength of Materials
Level: 2, 3

7. "Hyperbaric & Hypobaric Chambers"
Alan Letton
Suggested Courses: Mechanical Design, Materials Properties, Strength of Materials
Level: 2, 3, 4

8. "Mount Dioxin"
Edmund Tsang
Suggested Courses: Fluid Mech. and Statics
Level: 3

9. "Heat Pump Ethics Case"
Wayne Helmer
Suggested Courses: Heat Transfer
Level: 3,4

10. "Heat Transfer Ethics Case"
Wayne Helmer
Suggested Courses: Heat Transfer
Level: 3,4

11. "H.V.A.C. Design Ethics Case"
Wayne Helmer
Suggested Courses: Heat Transfer
Level: 3,4

Abstract I
Chemical Engineering Cases
presented by
Dr. Timothy Wick
Georgia Institute of Technology

Ten cases were developed by the Chemical Engineering break-out group. These cases cover a wide variety of engineering topics and ethical considerations appropriate for inclusion in most of the required unit operations courses in the chemical engineering curriculum. Of those cases, "Numerical Problems for Gilbane Gold" was selected for the ASEE Mini-Plenary session presentation.

"Numerical Problems for Gilbane Gold" provides numerical problems as a companion to the Gilbane Gold video. Z-Corp, a fictitious company, is discharging lead and other heavy metals as a by-product of computer chip manufacturing. The company anticipates a major expansion which will increase total lead output. To remain in compliance with local ordinances, the company plans to dilute the more concentrated discharge with water. As the story unfolds, David Jackson, a young environmental engineer, realizes that the diluted lead will be absorbed by the city's sewage sludge and ultimately end up on farmers' fields as fertilizer. This places quite a burden on David, and in the end, he becomes a whistleblower which will likely lead to disastrous consequences for him personally as well as Z-Corp. The students are asked to calculate the amount

of lead produced and the dilution factor required to remain in compliance after production is increased. Also the feasibility of adding ion exchangers or artificial wet lands to reduce lead emissions are compared to dilution. The ethical issues presented in "Numerical Problems for Gilbane Gold" revolve around moral obligations. The case is appropriate for mass and energy balances, engineering ethics, or environmental engineering courses.

Abstract II

Civil Engineering Cases
presented by
Dr. Charles R. Glagola, P.E.
University of Florida

"The Sinking Tower" was selected as the civil engineering case (out of the eight cases developed) for presentation in detail at the ASEE annual conference. This case was chosen as representative of the type of problematic ethical cases that can easily be included in undergraduate design curricula. An appealing feature of this case is that, by including additional numerical problems, the same case can be used in a number of design courses. "The Sinking Tower" as originally developed, is appropriate for use in a Junior level soils course. With the inclusion of two or three additional design problems, the case would be appropriate for courses in reinforced concrete design, structural steel, design project management and, possibly more appropriately, in a capstone design course.

The case involves the construction of a new football stadium. This is a particularly interesting problem because, as in a Tolstoy novel, it has many different characters and plots each with a compelling need to walk close to an ethical or morally responsible line.

The City of Pitcher formed the Stadium Authority (a separate governmental entity), which will build, own, and operate a new professional football facility in Pitcher. The Stadium Authority contracts with Matrix Engineering for design services and with BMCO for construction management services. Matrix then contracts for geotechnical engineering services with SoilTest Geotechnical Engineers.

Time is of the essence on this project and all contracts include very high damage costs if the project is delayed. Everyone is in a hurry! SoilTest is hurried by Matrix, through the urging of BMCO, to complete the geotechnical study so construction will not be delayed. To satisfy this urgent request, SoilTest sends out a pieced-together, ill equipped crew that attempts to complete the field testing in one day. The field testing is never completed and two critical soil boring locations have been missed. One of these locations is the West stair tower. Once excavation for the footing begins at the West stair tower, the soil conditions are visibly different than expected.

The young engineer for Matrix, Dennis Snead, wants to stop the work on the West stair tower and reevaluate the foundation design because of the obviously different soil condition. Dennis has been intimidated throughout the project by Hardnose, the field foreman for BMCO. Hardnose wants to pour concrete the next morning since liquidated damages are $10,000/day. Dennis has an engineering problem and an ethical problem. Does he let Hardnose pour concrete when he has doubts about the adequacy of the foundation design? Did SoilTest have a professional obligation to provide a complete boring log? Does Matrix have an ethical obligation to support Dennis in this difficult situation? What are Dennis' obligations to himself? What does the Code say?

Abstract III

Electrical Engineering Cases
presented by
Dr. Roy E. Voshall
Gannon University

Twenty cases having numerical and ethical content, along with the solutions, were developed by both an individual and group effort. The domain covered by the EE group was broad, so as to include the topics of computer science and introduction to engineering as well as the more traditional EE courses. Case number one, "Computer Encryption," by Jeremy Hanzlik, was selected to be discussed in detail for the Mini-Plenary session.

"Computer Encryption" has two narratives which can be used separately or together in order to bring different ethical issues to the students' attention. The premise is: a recently hired engineer develops software for protecting the security of e-mail in the U.S. offices of a multinational corporation (MNC). In the first narrative, the software has been sent overseas (in violation of a federal law), thus reducing the security of the U.S. In the second narrative the engineer is asked to take his work overseas and develop similar software for a different part of the MNC he works for. The engineer has heard reports on the local news that similar actions have developed into a legal suit for a software engineer outside his company. When he raises such concerns, his superior mentions that the young engineer will enjoy a nice week's vacation during the trip at company expense. Each narrative was discussed, along with the design problem of developing the software and the ethical issues. The ethical issues center on allowing the software to be distributed overseas and/or the problem of bribery. The proposed solutions to the numerical and ethical aspects of this case were discussed, along with how it met the guidelines of the workshop.

Abstract IV

Mechanical Engineering Cases
presented by
Dr. Edmund Tsang
University of South Alabama

Eleven cases were developed in the Mechanical Engineering break-out group. The case presented at the ASEE Plenary Session, "Mt. Dioxin," is a fictionalized case involving Superfund cleanup of an abandoned wood-treating facility adjacent to several African-American residential neighborhoods in the southeastern United States. In the industrial park where this wood-treating facility is located, there is another Superfund site involving a former pesticide manufacturing plant.

In June, 1990, during a remedial investigation and feasibility study (RI/FS) of a Superfund site, ACE Chemical Plant, a substance detected among the hazardous substances contaminating the groundwater was traced to an abandoned former wood-treating facility. The facility, ETC, was located 3,000 feet to the southwest. A search of records showed a RCRA (Resource Conservation & Recovery Act) inspection report in February, 1981 citing ETC for numerous instances of non-compliance, including no inspection logs, no personnel training records, no groundwater monitoring, no protective cover and inspections of surface impoundments, and no inspection schedules.

In September, 1991, preliminary assessment began at the ETC site to determine the extent of contamination. Results of soil sampling showed essentially the same concentration of PCP (around 160 parts per million) at heights from 4 feet to 8 feet below the surface in six different locations. No samples were collected below 8 feet. High concentrations of creosote, dioxin, benzene, lead and arsenic were also detected

on site. Based on this sampling study, the Environmental Protection Agency (EPA) began soil excavation under the Emergency Removal provision of the Superfund law, which means that work can begin without publishing a public notice.

Neighboring residents, some of whose backyards are only 15 feet from the ETC boundary, complained of skin rashes and respiratory problems when wind created dust during soil excavation. Among the residents are former ETC workers, who said the EPA site managers ignored them when they tried to tell them about additional contaminated sites.

Subsequent memoranda from the site manager to the EPA regional office indicated that the volume of contaminated soil increased from 54,000 cubic yards in January, 1992 to an eventual 255,000 cubic yards when soil excavation was finally completed in January, 1993. Today, this pile of contaminated dirt, which neighboring residents call "Mt. Dioxin," stands 30 feet tall and sits next to two huge holes in the ground. "Mt. Dioxin" is covered by a 60 mil thick UV-resistant vinyl tarp. Security around the ETC site was lax; the local newspaper reported that children were discovered breaking through the fence and using the vinyl-covered pile of contaminated soils as a giant slide.

From the locations where soil samples were tested and from the soil sampling data, engineering undergraduates can estimate the volume of contaminated soil, which would indicate the extent of soil contamination. The ethical problems associated with making decisions involving insufficient data, which lie at the heart of the "Mt. Dioxin" case study, are raised from three different perspectives: the EPA site manager, the EPA regional manager, and the engineer working for the firm performing the soil excavation. The issues involve loyalty to company versus public welfare, a public's right-to-know, and professional responsibility.

The "Mt. Dioxin" case study can be used as a homework problem for a junior-level course on fluid mechanics. The numerical problem concerns calculating the lift force acting on the vinyl tarp as a result of wind gusts that can exceeds 100 mph during a hurricane. Incidentally, the city where "Mt. Dioxin" is located was hit by three hurricanes between 1979 and 1995. A different numerical problem is suitable for a senior design project: design an anchoring system for the vinyl tarp, in the light of the fact that the integrity of vinyl will deteriorate with time when exposed to sun and rain.

Abstract V

Engineering Information on the Web
presented by
Dr. Lee Lowery
Texas A&M University

Dr. Lee Lowery's presentation centered around the case below involving a manufacturing firm and their "Hi-Stak" unit. The ASEE presentation also covered the challenges faced by the engineering community when attempting to use the world wide web as a medium of distribution for engineering data and information.

The Lakewood Company, a fairly large manufacturing firm, has designed, manufactured and sold hundreds of self-contained storage/retrieval systems which are used for storing heavy parts such as dies, which must be intermittently taken from storage and used elsewhere in the plant. The system consists of two large sets of storage racks, facing each other, with an integral crane that runs between them on two bridge crane girders on the top outside edges of the storage racks. The crane has fork-lift appendages that can slip under a pallet on any of the several levels of the storage racks, retrieve a pallet off the shelf, and move it to the end of the

storage racks. The pallet is subsequently placed on the ground for pickup by a fork lift and transportation to its final destination.

The Buchannan company, a large off-road construction vehicle manufacturer, purchased one of these Lakewood "Hi-Stak" units and was using it extensively until one of its employees, West Michaels, had an accident while operating the crane and was seriously injured. According to eye witnesses, West had retrieved a 1,460 pound die from the top shelf, and was pulling it to the end of the aisle. The load was well within the crane's advertised limit of 2,000 pounds. As stated in the accident report, West was thrown about 20 feet. His next recollection was awakening in the hospital bed.

The ethical question behind the case involves deciding whether the crane or the operator was at fault in the accident. Standard engineering calculations are required to determine the load carrying capacity of the crane, which turns out to be poorly designed, as well as energy and beam deflection calculations. The case is made more interesting in that even though the crane was poorly designed, it is alleged that the crane was operated in a reckless manner, and computations are used to verify or refute this claim. Multimedia presentations illustrate what happened, including engineering drawings and 3-d animation of the accident.

The case can be found at: **http://ethics.tamu.edu/ethics/stackbad/stackbad.htm**
All other cases can be found at: **http://ethics.tamu.edu/**

Biographical Appendix

Dr. Harris received his B.A. in biology and chemistry from Vanderbilt University in 1960 and his Ph.D. in philosophy from Vanderbilt in 1964. After three years at Southwest Texas State University, he moved to Texas A&M University, where he still teaches. He has been Interim Department Head and is now Associate Head of the Department of Philosophy at Texas A&M. His special teaching and research interest is applied ethics. He has published a number of papers in this and other areas of philosophy, as well as a book, Applying Moral Theories. For the past five years he has been involved in teaching and research in engineering ethics. He has co-authored a textbook, Engineering Ethics; Concepts and Cases. He has also been involved in the initiative to introduce questions on ethics and professionalism into the model examinations of the National Council of Examiners for Engineering and Surveying. Address: Dr. Charles E. Harris, Jr., Department of Philosophy, Texas A&M University, College Station, TX 44843. e-mail: e-harris@tamu.edu

Dr. Rabins received the B.S. from the Massachusetts Institute of Technology in 1954, the M.S. from the Carnegie Institute of Technology in 1954 and the Ph.D. from the University of Wisconsin in 1959, all in Mechanical Engineering. After serving as Assistant Professor at Wisconsin and Associate Professor at New York University from 1959 to 1970, he became a Professor and Director of Systems Engineering at the Brooklyn Polytechnic Institute. Dr. Rabins then became Chairman of Mechanical Engineering and then Associate Dean, at Wayne State University. He joined Texas A&M University as Head of the Department of Mechanical Engineering in 1987. Dr. Rabins was founding editor of the ASME Journal of Dynamic Systems, Measurement and Control. He is co-author of Engineering Ethics: Concepts and Cases Address: Dr. M.J. Rabins, Department of Mechanical Engineering, Texas A&M University, College Station, TX 77843. e-mail: m1r6609@acs.tamu.edu

Jeremy Hanzlik is currently an undergraduate student at Texas A&M University. He has followed the curriculum in Computer, Electrical, and Agricultural Engineering before selecting his current major, Bioenvironmental Science. With the completion of his undergraduate studies he plans to further his education in the technical fields and become an instructor at the University level. e-mail: j-hanzlik@tamu.edu