Dear Alumni,

As you may already know, this year we are conducting the Chemical Engineering Campaign. Our goal is to raise one million dollars in funds for graduate fellowships and undergraduate scholarships to support students in chemical engineering. The strength of the department is undoubtedly determined by the quality of the students and of the faculty. As we move into the new millennium, we want to maintain our strength and to significantly improve our educational and research programs. The undergraduate scholarships will help Carnegie Mellon to compete more effectively to attract the best students. The graduate fellowships will help us to support students for the six new faculty that we have hired over the last three years: Lynn Walker, David Sholl, Todd Przybycien, Lee White, Steinar Hauan and Jim Schneider. Since these faculty represent the future of the department, we urge you to be generous in your support. We are indebted to Ted Burtis (ChemE 1955) and to John Swearingen (ChemE 1939) for having already committed $300,000 towards our campaign. We will be most grateful for your contribution to Chemical Engineering.

I am also happy to report that this has been a good year in terms of a number of developments.

Professors Steinar Hauan and Jim Schneider joined our faculty. Steinar’s research area is in process systems engineering, and Jim’s is in biomaterials. We implemented the new curriculum with the sophomore class. Major features are lab courses and projects in the sophomore and junior year, five free elective courses, and the renaming of several courses to better reflect their content. Professor Art Westerberg received the ASEE Senior General Electric Award, which carries major national recognition. We had a very fruitful retreat with the industrial members of the advisory board who provided extensive input from industry for our education and research programs. An important outcome was a dialogue with the administrator for a better understanding of intellectual property issues which are critical for strong interactions with industry. Tom McConomy (ChemE 1955) and Professor Bill Russel from Princeton gave the Herb Toor and the Distinguished Research Lectures, respectively. Other important developments are described in the newsletter.

Finally, we are seeking help from our B.S. Graduates in Chemical Engineering. Next year we will have the accreditation visit by ABET. As opposed to the past when it was sufficient to demonstrate that we taught the required number of hours for a specified number of courses, we now need to show that we have assessed the effectiveness of our program with our current students, alumni and industrial employers. The objective of this assessment is to use it as a guide for implementing continuous improvement in the curriculum. If you would please fill out the enclosed form and mail it to us, you will do an enormous favor to us.

Thank you for your help and support, and I wish you all a happy new millennium!

Ignacio Grossmann
Faculty News

Six New Faculty Members to Kick-off the Next Millennium

Steinar Hauan
Steinar's research is in the area of computer-aided process design with special focus on multifunctional units. An important part of the work is to investigate how qualitative insights may be combined with numerical studies to arrive at solutions that are more readily understood.

David S. Sholl
David's expertise is in molecular simulation of nanostructured materials; adsorption, and transport in ordered microporous materials. His research focuses on materials whose macroscopic dynamic and thermodynamic properties are strongly influenced by their atomic-scale structure. Much of this research involves applying molecular simulation techniques such as molecular dynamics and Monte Carlo simulations to materials of interest.

Todd M. Przybycien
Todd's research area is biochemical engineering and applied biophysics. His group addresses the practical problems and underlying fundamental phenomena associated with the production, formulation, and delivery of pharmaceutical proteins generated by the biotechnology industry. They are pursuing the development of protein-based nanomaterials and the formulation of nucleic acids for gene therapy as extensions of our expertise in applied biophysics.

Lynn M. Walker
Lynn's research is quantifying the coupling between flow behavior and flow-induced microstructure in complex fluids. Her research is to develop a fundamental understanding of the flow-induced microstructures that exist in complex fluids through a combination of macroscopic rheological measurements and in situ microstructural probes.

James W. Schneider
Jim is probing changes in biological activity near biomembranes, with applications in gene and drug delivery. His research is to develop structure-property relationships for membrane-associated proteins, and to use these principles to engineer responsive peptides and surfaces for biotechnology applications.

Lee R. White
Lee's research is aimed at understanding the physical properties that control the interaction of particles in complex fluids and exploiting that understanding to optimize the operation of colloidal processes in industry.

Chemical Engineering Faculty and Research Areas

Bioengineering
Michael Domach, Todd Przybycien, James Schneider

Complex Fluids
John Anderson, Annette Jacobson, Dennis Prieve, Robert Tilton, Lynn Walker, Lee White

Environmental
Spyros Pandis

Process Systems Engineering
Larry Biegler, Ignacio Grossmann, Steinar Hauan, Gary Powers, Arthur Westerberg, Erik Ydstie

Solid State Materials
Andrew Gellman, Myung Jhon, David Sholl, Paul Sides
Faculty in the News

John Anderson received at the Pittsburgh AIChE Dinner at the Oakmont Country Club a recognition award for the Services and Contributions in Academics. Dr. Anderson has served as the Head of the Chemical Engineering Department of Carnegie Mellon University for eleven years (1983-1994). In 1996, Dr. Anderson became Dean of Engineering for CMU. Since this time, Dr. Anderson has initiated the Institute for Complex Engineered Systems (ICES) which promotes collaboration of CMU’s College of Engineering research with local industry for the benefit of both.

Spyros Pandis, Associate Professor of Chemical Engineering and Engineering and Public Policy, is this year’s recipient of the College of Engineering’s Benjamin Richard Teare Teaching Award for Excellence in Engineering Education. Teare was dean of the college from 1953-66. Professor Pandis has also been involved with the BBC news! A group from Chemical Engineering and Engineering and Public Policy has recently published an article in Nature on the effect of sulphur emissions of ships on climate change. The BBC has also covered that study.

Andy Gellman receives the Lord Chair. Professor Gellman joined the department of Chemical Engineering at Carnegie Mellon as an associate professor in 1992. He has become an internationally recognized leader in the field of surface sciences, catalytic processes at surfaces, and tribology. Much of Professor Gellman’s work involves study of the bonding of molecules to metal surfaces, surface reaction kinetics, friction and lubrication. His use of surface science methods allows investigation of problems in heterogeneous catalysis at the most fundamental level. A member of the Data Storage Systems Center, Gellman’s work in tribology has focused on the efficacy and stability of molecular layers of lubricants protecting magnetic media in disk drives.

David Sholl. Each week the APS selects one paper from Physical Review Letters and has a general purpose commentary written for non-specialists and the science press. A commentary was recently published on a collaboration of David Sholl with Karl Johnson at University of Pittsburgh on carbon nanotubes.


Arthur W. Westerberg won the ASEE GE Senior Research Award Professor Westerberg has been selected by the American Society of Engineering Education for the 1999 General Electric Senior Research Award for Excellence in Engineering Research. This is the highest award that ASEE grants in research. The only other chemical engineer who has won this award in the recent past is Howard Brenner (now at MIT, formerly at Carnegie Mellon) in 1996. The award’s purpose is to recognize and honor an engineering staff or faculty member who has made significant contributions to engineering research by pushing forward the frontiers of knowledge, by perfecting and applying the latest scientific advances to engineering problems, or by providing administrative leadership in important research programs. The award consists of a gold medal and a certificate.

Happy 50th Birthday Ignacio!
Alumni News

Kears Pollock was recognized for the Services and Contributions in Industrial and Corporate Accomplishments by the Pittsburgh AIChE Local Section. Mr. Pollock, a 1964 graduate of Carnegie Mellon University, with a Masters of Science in Chemical Engineering and a 1970 graduate of Duquesne University Law School, now holds the title of Corporate Executive Vice President and Member of the Office of the Chief Executive for PPG Industries, Inc. Mr. Pollock holds four U.S. Patents and is regarded universally as the key scientific and engineering resource for the entire company. Despite holding such a position, Mr. Pollock still interacts directly with chemists and chemical engineers throughout his corporation to learn of new opportunities and help direct priorities.

Advisory Board Meeting

The University requires each department to have an advisory meeting every 3-4 years in order to evaluate its academic and research programs. The department will have its advisory board meeting on April 24-25, 2000. The members of the board who will participate are the following:

Professor J. Larry Duda
Pennsylvania State University

Mrs. Carol M. Dudley
The Dow Chemical Corporation

Dr. James Ebel
Procter & Gamble Company

Dr. Leonard Gerlowski
Shell Chemical Company

Professor Eduardo D. Glandt
University of Pennsylvania

Dr. George Hill
The Lubrizol Corporation

Dr. Michael Kosinski
Merck & Company

Thomas A. McConney, Chair
Cylon Carbon Corporation

Dr. Stanley Morris, Co-chair
Air Products & Chemicals, Inc.

Mr. E. Kears Pollock
PPG Industries, Inc.

Professor G.V. Reklaitis
Purdue University

Professor Stanley I. Sandier
University of Delaware

Professor Michael L. Shuler
Cornell University

Dr. Jeffrey J. Sirola
Eastman Chemical Company

Dr. Klaus Sommer
Bayer Corporation

Professor Arnold Stancell
Georgia Institute of Technology

Dr. James Trainham
Dupont Corporation

Dr. Lynn Yano
Loid Corporation

Outreach Volunteers Needed

The Colloids, Polymers and Surfaces (CPS) Program provides a number of hands-on programs for middle school and high school students each academic year to encourage youth to consider careers in engineering and science. They include SWE-sponsored High School Day in October, Expanding Your Horizons in Science and Math in March, Moving 4tn into Engineering in April and the SWE sponsored Engineering Your Future in July. In November 1999 we provided hands-on polymer experiments for National Chemistry Week at the Carnegie Science Center.

Please contact us if you are interested in science activities for K-12 students for youth groups. Annette Jacobson, CPS Program Director, jacobson@andrew.cmu.edu, or 268-2244; Rose Frallini, CPS Lab Manager, rfn@andrew.cmu.edu or at 268-1654.
The 21st Annual Chemical Engineering Symposium

Once again the Chemical Engineering Graduate Student Association has delivered another successful Symposium. The 21st Annual ChEGSA Symposium took place on October 7th and 8th at Carnegie Mellon University.

This year’s keynote speaker was Professor Michael L. Shuler, Samuel B. Eckert Professor of Chemical Engineering at Cornell University, Ithaca, New York. Professor Shuler has a joint appointment in the Institute of Food Science and he is also the Director of the Chemical Engineering and Bioengineering Program at Cornell University. His address title: “An Engineering Perspective on Functional Genomics” was well received by the Symposium audience constituting of industrial guests, faculty and graduate students.

As always, the ChEGSA Symposium is not possible without the generous contribution from our industrial Sponsors and Contributors. The Department of Chemical Engineering and ChEGSA is very grateful for this support.

Ignacio Grossmann welcomed keynote speaker, Professor Michael L. Shuler who addressed students at the Annual ChEGSA Symposium.

The 1999 Symposium Winners

Student presentations were evaluated by a panel of judges who decided our five winners.

The 1999 Geoffery D. Parfitt Memorial Award was presented to Susara A. van den Heever.

“Nonlinear Multi-period Design and Planning of Offshore Oilfield Infrastructures.”

The Symposium Award was presented to Timothy D. Power,

“Enantiomeric Differentiation on Naturally Chiral Pt Surfaces.”

and MyHANG T. TRUONG

“The Effects of Nonionic Polymer on the Shear-thickening of Dilute Rod-like Micellar Systems.”

The Honorable Mention was presented to Raymond Dagastine,

“A New Distance Resolution Technique for TIRM”

and Vianey Garcia-Osciro,

“Passivity Theory Applied to Dynamic Simulation.”

The 1999 Sponsors include:

Air Products and Chemicals, Inc.
Aspen Technology, Inc.
Bayer Corporation
The BOC Group
Bristol-Myers Squibb Company
Calgon Corporation
The Dow Chemical Company
Exxon Corporation
The Lubrizol Corporation
Lyondell, Merck & Company, Inc.
Mitsubishi Chemical Corporation
Nova Chemicals Corporation
Proctor & Gamble
Seagate Technology
Shell Chemical Company
Simulation Sciences, Inc.
Union Carbide

The 1999 Contributors include:

BOC Gases
International Paper
Reference Metals Company, Inc.

General Electric Company
Johnson & Johnson

“...The ChEGSA Symposium is strongly emerging as the Department tradition. Each of us draws indispensable benefits by becoming a Symposium participant. As the Chairman, I challenge and wish that we can support the flourishing of the ChEGSA Symposium for many years to come.”

— Martin Ruszkowski
**Graduate Student News**

**Millicent Ow Receives Luce Fellowship**

Second year graduate student Millicent Ow received a Clare Booth Luce Fellowship late last Spring in a competition open to all newly admitted and first year women doctoral students at Carnegie Mellon. The award of the fellowship reflects Millie's strong academic performance both as an undergrad at Princeton and as a Carnegie Mellon graduate student as well as her demonstrated commitment to scientific research. Millie had already worked with five different research groups at four different academic/governmental institutions prior to joining Professor Przybycien's research group! The fellowship consists of $25,000 for two years with support for tuition, stipend, conference attendance and other professional expenses. Millie's Ph.D. research involves the development of colloidal gold vectors for the formulation and delivery of RNA in gene therapy.

**Undergraduate Student News**

**Rothfus Lab**

Students are currently adapting this small-scale distillation column to accept feed streams from the Rothfus Lab's Liquid-Liquid Extraction experiment. Their project will reduce wastes and save on chemical costs. Computer control, along with the ability to change the column's trays provides experimental flexibility.

*Two students are shown using the Packed Beds experiment to study flow and pressure drop.*

First-year students taking the department's introductory chemical engineering course now get hands-on experience with equipment in the Rothfus Lab.

**PISCES Experiences**

Erika Eve Fleckenstein spent her 14-month co-op working for Shell Chemical Company in Houston, Texas. She had two assignments, both in the epoxy resins process research group. Her first assignment was doing lab work and analyzing to design a process to make a series of resin precursors. Her second assignment was in the waterborne resin area. There she also did lab work to design manufacturing processes, but she was able to get manufacturing experience as well. She helped with a plant run when a product that she did lab work for was made on-scale. She also helped in the pilot plant production of a product that she had worked on in the lab. Erika was a member of a startup team for a semi-continuous reactor. Her second summer Erika coached and mentored several summer interns. She also sized, priced, procured, and installed a high torque bench top air motor.

On the whole, Erika stated that her co-op experience was a positive one, and would definitely do it again. She learned a lot about how large chemical companies operate and her manufacturing experience was particularly valuable. It was eye-opening to see what chemical engineers actually do on-the-job, and the wide varieties of jobs that they can have. Even though she had family in Houston and made friends at work, Erika missed her friends from school, and missed going through her senior year with them.

Jason A. Brunsell had the opportunity to participate in the PISCES program with Dow Chemical for 15 months between his junior and senior year. During this time, he participated in research for new products, customer service and development, new process research, process optimization studies, and an unplanned plant shutdown. After working at Dow, Jason stated that he has gained many things. First of all, he gained some direction as to what he wants to do in industry. He has gained many of the skills that first-year engineers must learn in order to become productive. And the experience Jason gained makes him more attractive to employers.
Department Lectures

Special Lecture Series

The 1999 Herbert L. Toor Chemical Industry Lectureship
was held on Tuesday, September 7, 1999, from 4:30-5:30 p.m. in McConomy Auditorium in the University Center. Thomas A. McConomy, Former Chairman and CEO of Calgon Carbon Corporation spoke on "The Uses of a Chemical Engineer's Education."

At the reception, pictured top, left to right, Tom McConomy, Edwar Shamshoum, Ignacio Grossmann, President Cohon

Pictured bottom, left to right, President Cohon, Tom McConomy, Herb Toor, Ignacio Grossmann and John Anderson

1999 Distinguished Research Lecture

Hard Sphere Colloids: the Simplest Complex Fluid was presented by Professor William B. Russel Department of Chemical Engineering, Princeton Materials Institute, Princeton University

Far left, Distinguished Lecturer Bill Russel displays autographed picture of the other Bill Russel.

Left, Bill Russel proudly wears the Pittsburgh Pirates baseball hat.

Below, Bob Brown, Bill Russel, and John Anderson
What's New in the Department?

New Center in Chemical Engineering

Center for Advanced Process Decision-making (CAPD)

Since 1985, the CAPD Laboratory at Carnegie Mellon University has been an internationally recognized research leader in computer-aided process systems engineering. Currently, the research group consists of six chemical engineering faculty (Larry Biegler, Ignacio Grossmann, Steinar Hauan, Gary Powers, Art Westerberg and Erik Ydstie), 24 graduate students, five postdoctoral fellows and two research assistants.

We are proud to announce a new name for the CAPD Laboratory. This name change reflects two very important realizations over the past year. First, because of its multidisciplinary emphasis and research scope, the CAPD has been designated as a Center in the Carnegie Institute of Technology, our engineering college. Second, the activities of our center are much broader than our traditional focus on computer aided process design. They also include research in supply chain optimization, process control, and process operations. Our name change reflects this broader focus and expands into new directions for process systems engineering. Research efforts within the CAPD have led to significant optimization-based strategies and tools for process design and operations for both batch and continuous processes: commercially available mathematical programming software (SQP-DICOPT), design strategies for process synthesis (SPLIT), tools for energy management (SYNHEAT); software for batch scheduling (STBS), advanced modeling environments for process simulation and analysis (ASCEND); and information management of the entire design process (LIRE).

The current members of the CAPD center are:

- Air Products and Chemicals
- Alcoa
- AMOCO Chemical Corporation
- Aristech Chemical
- Aspen Technology
- Bayer
- BP America, Inc.
- DuPont Corporation
- Eastman Chemical Company
- Elf Acquitaine
- ELKEM
- Exxon Chemicals
- Honeywell
- Hyprotech
- Imperial Chemical Industries
- Kvaerner
- Mitsubishi Chemicals
- Mobil Technology Company
- Unilever Research
- UOP

To learn about the Center for Advanced Process Decision-making, we invite you to visit our web page: http://www.cheme.cmu.edu/research/capd for information on our research projects, recent publications, and industrial success stories.
The following papers were presented by our faculty and graduate students at the AIChE annual meeting in Dallas, November 1-5:


L.T. Biegler, Andreas Waechter and Kentaro Yasuda, "Optimization with Simulation Manager and AspenPlus."

L.T. Biegler, D. Alkaya and Srilam Vasanthanjan (Mobil Technology Co.), "Process Integration by Using Existing Models for Simultaneous Flowsheet Optimization."


M. M. Domach, Joon-Hyung Kim and R. D. Tilton, "Solubilization in Polymer-Surfactant Complexes."

M. M. Domach, Mohammad M. Atabai (Univ. of Pittsburgh), R. A. Fry (Univ. of Pittsburgh), R. R. Koepsel (Univ. of Pittsburgh), and C. Phalakornkule, "Alternate Flux Routing for Efficient Allocation of Metabolic Resources."

A.J. Gellman, Mark T. Buelow and Ge Zhou, "The Nature of the Transition State for Catalytic Hydrodechlorination."

A.J. Gellman, Mark T. Buelow and Josh Harvath, "Chemistry on Chiral Single Crystal Surface."

A.J. Gellman and Jeff S. Ko, "Frictional Anisotropy at Ni-Ni Interfaces."

A.J. Gellman and Daxing Ren, "Surface Chemistry of VaporPhase Lubrication."

F.E. Grossmann, Jin-Kwong Bok and Suwon Park (KAIST), "Supply Chain Optimization of Continuous Flexible Process Networks."


I.E. Grossmann, Edgar Pereira, Turaj Tahmassebi (Unilever), B.E. Ydstie, "Towards the Integration of Dynamics and Control for the Optimization of the Supply Chain."


I.E. Grossmann and Vipul Jain, "Constraint Logic Programming Strategies for Solving MILP Scheduling Models."

S. Hauan, D. Glasser (WITs Univ.), L. Hausberger (WITs Univ.), D. Hildebrand (WITs Univ.), C. McGreggor (WITs Univ.), "An Attainable Region Approach to the Analysis of Ammonia Synthesis."

S. Hauan, J.W. Lee and A. Westerberg, "Pinch Points and Reachable Products in Reactive Cascade Sections."

S. Hauan, J.W. Lee and A. Westerberg, "Extreme Conditions in Reactive Distillation."

M. Jhon, R. Armstrong (Sandia National Laboratories), S.J. Vinay, Peter Wyckoff (Sandia National Laboratories), "Fluid Flow Modeling using Smoothed Particle Hydrodynamics."


M. Przybycien, Jeff Bell (New York State Dept. of Health), A.C. Keyes, "A Protein Assembly Simulation for Prediction of the Tendency of Mutant Proteins to Crystallize."

D.S. Sholl, "Modeling Single-Component Permeation through a Zeolite Membrane from Atomic-Scale Principles."

D.S. Sholl, "Multiscale Modeling of Adsorbate Transport in Zeolites."

D.S. Sholl, S.R. Challa (Univ. of Pittsburgh), and J.K. Johnson (Univ. of Pittsburgh), "Isotope Mixture Adsorption in Carbon Nanotubes."

D.S. Sholl, S.R. Challa (Univ. of Pittsburgh), and J.K. Johnson (Univ. of Pittsburgh), "Adsorption-based Separation of Isotope Mixtures Using Quantum Slewing."

D.S. Sholl and T.D. Power, "Enzymatic Selective Adsorption Properties of Naturally Chiral Metal Surfaces."

L.M. Walker and B.G. Theobald, "Flow-Induced Transitions in Cationic Surfactant Solutions in Homogeneous and Nonhomogeneous Flows."

R.D. Tilton, D.C. Priewe, A. Braun, "Coadsorption from Polymer-Surfactant Mixtures to Selective Surfaces."

R.M. Walker and My Hang Truong, "Control of Flow-Induced Structural Transitions in Mixed Systems of Micelles and Nonionic Polymer."


Lee R. White, "Filtration of Flocculated Colloidal Suspensions (Invited)."

B. Erik Ydstie, A.A. Alonso (University of Vigo), J.R. Banga (Instituto de Investigaciones Marinas CSIC), Isidro Martin (University of Vigo), "Asymptotic Stabilizing Control Design for Distributed Process Systems."

B. Erik Ydstie and Jennifer Hsu, "Adaptive Robust Control With Unknown Disturbances."

B. Erik Ydstie and Duncan R. Coffey, "Process Stabilization and Real-time Optimization."

Session Chairpersons

Andrew Gellman, Fundamentals of the Mechanical and Tribological Properties of Surfaces.

Dennis Priewe, Symposium in Honor of Eli Ruckenstein for his National Medal of Science Award I, II

David Sholl, New Approaches for Simulating Long-Time Phenomena

Paul Sides, Chemical Vapor Deposition

Lynn Walker, Polymer Thermodynamics II
Senior Survey

We Value Your Opinion

At the end of each academic year, we survey the graduating class to obtain an idea of student satisfaction, look for perceived weaknesses and strengths and guide curriculum changes. Overall, we are pleased with the responses from our students. In most areas, students are positive about the education received here at CMU. The students feel that they are well prepared to work in teams, apply basic engineering skill and analyze problems. Students were also satisfied with most of the programs and opportunities available to them through departmental efforts. We are working to improve in several areas including exposing our students to contemporary and global issues and increasing faculty/student interactions.

The table below outlines student response to the ABET criteria. These are the skills that our students are required to develop during their stay at CMU as stated by ABET.

<table>
<thead>
<tr>
<th>Skill or Ability</th>
<th>Poor</th>
<th>Satis.</th>
<th>Strong</th>
<th>1999*</th>
<th>1998</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to apply knowledge of mathematics, science and engineering</td>
<td>1</td>
<td>14</td>
<td>24</td>
<td>4.18</td>
<td>4.37</td>
</tr>
<tr>
<td>Ability to design experiments and analyze and interpret data</td>
<td>0</td>
<td>12</td>
<td>27</td>
<td>4.38</td>
<td>4.00</td>
</tr>
<tr>
<td>Ability to design a chemical process</td>
<td>5</td>
<td>25</td>
<td>9</td>
<td>3.21</td>
<td>3.74</td>
</tr>
<tr>
<td>Ability to function on multidisciplinary teams</td>
<td>2</td>
<td>10</td>
<td>27</td>
<td>4.28</td>
<td>4.58</td>
</tr>
<tr>
<td>Ability to identify, formulate and solve engineering problems</td>
<td>0</td>
<td>21</td>
<td>18</td>
<td>4.28</td>
<td>3.74</td>
</tr>
<tr>
<td>Understanding of professional and ethical responsibility</td>
<td>2</td>
<td>19</td>
<td>18</td>
<td>3.82</td>
<td>3.68</td>
</tr>
<tr>
<td>An ability to communicate effectively</td>
<td>2</td>
<td>15</td>
<td>21</td>
<td>4.00</td>
<td>3.89</td>
</tr>
<tr>
<td>Broad education necessary to understand Eng. Solutions in global/societal context</td>
<td>3</td>
<td>22</td>
<td>14</td>
<td>3.56</td>
<td>3.37</td>
</tr>
<tr>
<td>A recognition of the need and ability to engage in life-long learning</td>
<td>1</td>
<td>13</td>
<td>24</td>
<td>4.21</td>
<td>4.26</td>
</tr>
<tr>
<td>A knowledge of contemporary issues</td>
<td>11</td>
<td>19</td>
<td>8</td>
<td>2.84</td>
<td>3.00</td>
</tr>
<tr>
<td>Ability to use techniques, skills, and modern engineering tools necessary for engineering practice</td>
<td>1</td>
<td>22</td>
<td>16</td>
<td>3.77</td>
<td>4.11</td>
</tr>
</tbody>
</table>

(*) The "Overall Rating" was determined by a weighted "FCE-style" average of the responses ("poor"=1, "satisfactory"=3 and "strong"=5)
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Carnegie Mellon

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of the Carnegie Mellon Human Relations Office, will be
selected fully to the extent that opportunities exist at
the time of their employment, and will receive full
consideration for promotion and other positions
available to men.

The Department of Defense policy of "Do not ask, don't
ask, don't tell, don't pursuit," includes openly gay, lesbian
and bisexual students from receiving ROTC scholarships
or serving in the military. Moreover, all PG & ED classes at
Carnegie Mellon University are available to all students.
Inquiries concerning application of these statements should be
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Vice President for Enrollment, Carnegie Mellon University,
5000 Forbes Avenue, Pittsburgh, PA 15213, telephone
(412) 384-8684. Obtain general information about