

take the Philip Morris
what kinds of ethical
how the device should
and you agree that it

alternative but to place
ally has the requisite
ould that expert be
an the best system is
Moreover, what assur-
not being oversold or
ent should software
etermining precisely
ary are—and to try
er more than is nec-
profit or less than is
a lower bid?

ulation. He also out-
ears to address these
than wait until it is

at most engineering
de direct statements
ilities of engineers.
ed the ranks of engi-
section III. Profes-
sors. "Engineers shall
public interest." Under
y, d. "Engineers are
opies of sustainable
the environment for
addresses the concep-
"sustainable devel-
ent" is the challenge
natural resources,

industrial products, energy, food, transportation, shel-
ter, and effective waste management while conserving
and protecting environmental quality and the natural
resource base essential for future development."

Although this definition of sustainable develop-
ment leaves many fundamental conceptual and value
questions in need of further analysis (e.g., What are
human needs? What is meant by "environmental qual-
ity"?), it provides a general framework for inquiry. It
also identifies a variety of fundamental areas of con-
cern (e.g., food, transportation, and waste manage-
ment). Of course, responsibilities in these areas do
not fall only on engineers. Government officials, econ-
omists, business leaders, and the general citizenry
need to be involved as well. Thus, a basic question
relates to how those who need to work together
might best do so and what role engineers might play.
We offer three illustrations for discussion. The first is
an early effort to involve students from different disci-
plines in a project that supports sustainable develop-
ment. The second is the recent proliferation of centers
and institutes for sustainability on college campuses
throughout the country. The third is service learning
opportunities in support of sustainable design and
development.

RENEWABLE ENERGY¹⁰⁷

Dwayne Greger, a civil and environmental engineer at
Lafayette College, invited junior and senior engineer-
ing, biology, and environmental science students to
apply to be on an interdisciplinary team to design a
project that would make use of farmland owned by
Lafayette College in a way that supports the college
mission. Twelve students were selected for the project:
two each from civil and environmental engineering,
mechanical engineering, chemical engineering, and
Bachelor of Arts in engineering, plus three biology
majors and one in geology and environmental geos-
ciences. These students had minors in such areas as
economics and business, environmental science,
chemistry, government, and law. The result of the proj-
ect was a promising design for a biomass farm that
could provide an alternative, renewable resource for
the campus steam plant.¹⁰⁸

Professor Greger regards projects such as this as
providing important opportunities for students to
involve themselves in work that contributes to

restructuring our energy use toward sustainable
resources. ABET's *Engineering Criteria 2000* for evalu-
ating engineering programs includes the requirement
that engineering programs demonstrate that their grad-
uates have "an understanding of professional and ethi-
cal responsibility," "the broad education necessary to
understand the impact of engineering solutions in a
global and societal context," and "a knowledge of
contemporary issues." Criterion 4 requires that stu-
dents have "a major design experience" that includes
consideration of the impact on design of such factors
as economics, sustainability, manufacturability, ethics,
health, safety, and social and political issues.¹⁰⁹ Dis-
cuss how the Lafayette College project might satisfy
criterion 4, especially the ethical considerations.

ACADEMIC CENTERS FOR SUSTAINABILITY

Historically, joint research in colleges and universities is
done within separate disciplines rather than in collabora-
tion with other disciplines. Thus, biologists collaborate
with other biologists, chemists with other chemists,
economists with other economists, and political scien-
tists with other political scientists. The recent emergence
of centers and institutes for sustainability represents a
significant and important break from that tradition.

In September 2007, the Rochester Institute of Tech-
nology initiated the Golisano Institute for Sustainabil-
ity.¹¹⁰ Noting that it is customary for new programs to
be run by just one discipline, Nabil Nasr, the institute
director, comments, "But the problem of sustainability
cuts across economics, social elements, engineering,
everything. It simply cannot be solved by one disci-
pline, or even by coupling two disciplines."¹¹¹

Dow Chemical has recently given the University
of California at Berkeley \$10 million to establish a
sustainability center. Dow's Neil Hawkins says, "Ber-
keley has one of the strongest chemical engineering
schools in the world, but it will be the M.B.A.'s who
understand areas like microfinance solutions to
drinking water problems."¹¹² The center is in Berke-
ley's Center for Responsible Business, directed by
Kellie A. McElhane. Commercialization of research
undertaken by students and professors is expected.
However, McElhane notes, "Commercialization
takes forever if the chemical engineers and the