Engineering and the Liberal Arts: Toward Academic Cosmopolitanism

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ABSTRACT: What needs to be done to create engineers whose skills, knowledge, and intellectual appetites enable them to respond thoughtfully and innovatively to the challenges of sustainability and other pressingly complex social issues? This question invites thinking not only about how to integrate more of the liberal arts into the educational pathways for future engineers, but also, in the context of bringing such integration, about what might be done differently within liberal arts education itself. Currently the liberal arts themselves do a better job in general at introducing technology itself into the classroom than they do at focusing on technology as a subject-matter for examination and reflection. Much more could be done by way of cultivating epistemic respect for technology and its significance in shaping our world; and more emphasis could be placed on building capacity for curiosity, shaping good questions, and creative problem-framing. The development of such broad, "cosmopolitan" affordances of mind would I propose help engineering and non-engineering students alike to see themselves as part of a single academic culture of inquiry within an ever-increasingly unpredictable world.

I want to begin by thanking President Ainlay and the members of the steering committee for their graciousness in extending an invitation to me to make a contribution to this year’s symposium. It is a special pleasure to be here and to be a part of these conversations. I first learned about the existence of this project last Fall by reading about it and looking through the proceedings on the Web. I thought it was a really exciting initiative and so when I was invited to come I admit to responding fairly unphilosophically; that is, I said “yes” with relatively little hesitation and consequently relatively little reflection. Afterwards, it occurred to me that it might have made some sense to first ask what my role in this symposium would be. When I did ask, the hope was expressed to me that my remarks, together with those of President Duncan, would offer complementary perspectives on the issue of integrating engineering education with a liberal education. I would make the case from the side of the liberal arts, President Duncan from the side of engineering, the result being that our remarks would effectively serve as bookends to one another and so help support and stimulate discussion.

With the image, then, of bookends in mind, I thought I would begin with a book; or more precisely, with a question posed at the beginning of a book. The book is *Man in the Age of Technology* (English translation, Columbia University Press, 1980), by the German philosophical anthropologist Arnold Gehlen. Gehlen’s ultraconservatism, including his harsh assessment of all forms of modernism, have quite reasonably served to deflate the value of his stock in the contemporary marketplace of ideas. Still, the questions about which he worried are ones that continue to be worrisome today. “It is not clear,” he reflected, “why in Germany we remain reluctant to concede the same rights of citizenship to technique as to other forms of culture.” Perhaps the fault lay with the usual suspects—the primacy of theory over practice, or pure over applied science—or perhaps even, as Gehlen went on to speculate, that the intellectual resources of German idealism were sufficient to solve all the problems of humanity. Over half a
century later from when these words were originally written, the reluctance Galen noted to extend to technique, and we might add to technology as well, the same credentials and rights of cultural citizenship long ago extended to literature, philosophy, art, history, mathematics, physics and the like, while abating somewhat, still continues to persist. Consider these words from Wybo Houkes, a professor at Eindhoven University of Technology in the Netherlands:

Designing is of vital importance for every human society—from early tool-users to heavily technologically-dependent contemporary societies. The products of designing range from skyscrapers to microchips and weather satellites to wicker baskets. Yet accounts of design, particularly within analytic philosophy, are as rare as Siberian tigers—and not nearly as actively sought out.¹

Some years ago, a cartoon appeared in the New Yorker showing a typical scenario in a Human Resource office: a person sitting in front of a desk handing a resume to the person behind it. The caption read: “Yes, I am a philosopher, but I am willing to learn.” What is there to learn from systematically considering the prospects for integrating engineering education with liberal education? From the viewpoint of the liberal arts, I believe there is a good deal to learn about how things might be done differently. The suggestion I would like to make and defend here is one that is simple and straightforward. To make a case from the standpoint of the liberal arts for taking engineering as a liberal art is not simply a matter of arguing that engineering education shares or is moving in the direction of sharing a similar set of interests or learning goals as those associated with liberal education, that it “makes the cut,” so to speak, although these reasons play a very important role in making this case. But, from the standpoint of the liberal arts, another very important part of making the case that engineering is a liberal art is to acknowledge that liberal education itself needs to adjust, needs to make change within itself and be more open to what matters to the education of engineers. And, in so changing, liberal education can renew and revitalize some of its own basic concerns and fundamental tenets.

The observations by Gehlen and Houkes with which I began might serve as points of orientation for getting at the substance of what kind of change would be helpful. On the one hand, from the time that phrases first began to be used such as “the technological age” and “the technological society” until now, these and similar descriptions have become commonplace labels for the times in which we live and the horizon against which we strive to make sense of our experience and our place in the world. The products and processes of engineering increasingly shape the goods we pursue, including those goods associated with participation in a democratic society. On the other, despite the fact that one of the fundamental purposes of a liberal education is to stimulate the broad, “big-picture” thinking essential for making sense of our experience, including thinking about the nature of the present age and the question of what the material conditions of existence ought to look like in order to promote opportunities for different individuals to pursue a variety of conceptions of the good life, there is surprisingly little attention given within liberal arts curricula to thinking about technology itself and our relations to machines and tools.

This is a paradox that thinking about ways of integrating engineering education with liberal education might aid in dismantling, so that in an age that as matter of course is referred to as “the technological age,” technology itself could become more

foregrounded within the terrain of a liberal education, in general and as a matter of course.

Let me underscore those last few words: “in general and as a matter of course.” I am thinking here for example of the kind of foregrounding that takes place in mission statements: those expressions of the commitments of institutions of higher learning that are most deeply reflected in the shape of the curriculum. Some of our colleges have been forerunners in explicitly foregrounding in the context of our mission statements the importance of understanding technology as a student learning outcome. Witness Union College’s statement: “We develop in our students the analytic and reflective abilities needed to become engaged, innovative, and ethical contributors to an increasingly diverse, global, and technologically complex society.” Similarly, Colby College counts among its “ten precepts” of a liberal education the mandate to examine “the interconnections between developments in science and technology and the quality of human life.” Such overt recognition of the importance of understanding our situatedness in a technological society, though, tends to be the exception rather than the norm in the mission statements of many of our colleges. I should note parenthetically that Colby also counts among its educational goals the even rarer one of wanting its students to live lives in which they would be happy with themselves. I’ll return to happiness later on, but for the moment, continuing to develop the paradox just mentioned, I want to give an illustration of how in at least one of the traditional disciplines of the liberal arts, surprisingly little weight in a technological age is afforded to a critical understanding of technology itself.

I draw this illustration from the discipline with which I am most familiar, my own. In the Fall of 2008, the Board of Officers of the American Philosophical Association, upon the recommendation of the association’s Committee on the Status and Future of the Profession, adopted a statement on the role of philosophy in higher education. At the heart of this statement stands an identification of ways that philosophy can make an educational difference at the undergraduate level, both in itself and through its contributions to other fields of study. In particular, philosophy is seen to add to the undergraduate educational experience in four ways: (1) by fostering habits of critical thinking capacious enough to construe as not only the skill of evaluating arguments but also the acquisition of an attitude of intellectual restlessness or “benign skepticism,” as the statement puts it; (2) by helping students to become active readers of difficult theoretical material and to become better writers and public speakers through learning how to present their own viewpoints on complex issues; (3) by deepening students’ knowledge of the intellectual heritage of Western thought as well as that of other intellectual traditions; and (4) by developing students’ capacity for reasoning about ethical issues and questions of moral value. And, the statement goes on to note that philosophers have made influential contributions to contemporary debates on a variety of global issues, including environmental pollution, global climate change, and human rights and humanitarianism.

In one regard, this breadth and scope of this statement is testimony to the developing convergence in higher education between engineering and the liberal arts. A good deal of overlap can be found among the four educational goals it underscores in the course of making the case that far from being part of the icing on the academic cake, philosophy has a vital role to play in any setting of contemporary higher education, the goals of the liberal arts in general, and the goals that should be involved in educating future engineers from the
perspective of the National Academy of Engineering’s vision of the engineer of 2020. But along with this breadth and scope one can’t help but note—or I at least can’t help but note, and I concede that my service as the current president of the Society for Philosophy and Technology gives me a certain sensitivity on this score—that there is an almost total absence of any mention of technology as a desirable object of philosophical inquiry.

One would for example search this statement in vain for any mention of how the study of philosophy might serve the goal of providing students with a critical and systematic understanding of the technological dimensions of the world we inhabit—the goal that was the impetus for the formation of the Society for Philosophy and Technology in the mid-1970s. Nor would one find mention of how the study of philosophy aids in the exploration of how human values become embedded in the products of engineering design, or of how these products in turn have an impact on us and the values and goods that we pursue, or of how philosophers, in addition to adding their reflective voices and perspectives to debates on global issues, might also collaborate with other professionals in processes of design that would add to human well-being and flourishing. The statement’s comments on philosophy’s contribution to interdisciplinary studies are also telling. Let me quote: “Various kinds of philosophy of science courses can be valuable to a program in Science and Technology. Sustainability Studies would be enhanced by courses in the philosophy of environmental science and environmental ethics.” No mention of how the study of the philosophy of technology or the philosophy of engineering might make a useful contribution to either of these programs as well.

In taking this statement to task, a caveat is in order. I do believe it is valuable for the primary professional association of philosophy in this country to explicitly lay out how philosophy contributes to higher education, and certainly such a statement is particularly welcome at a time when demands for accountability and budgetary constraints combine to put increasing pressure on departments and programs to justify their very existence. Still, and I trust in accordance with the principle of “benign skepticism,” I find the absence of technology as a subject of philosophical inquiry puzzling, to say the least.

As Lance Schachterle rightfully observed at last year’s symposium, the roots of this kind of overlooking of the technological extend back to the original separation of the liberal arts from the illiberal arts during the medieval ages, to the point in time when a robust life of the mind became identified with the thinking that focused on intangibles: on ideas, on the linguistic expressions of ideas, on God. Related divisions within academic culture, such as those between pure or theoretical and applied research, between the hard and the soft sciences, between an “armchair” approach to inquiry and experimentalism, between courses of study that work to prepare students for professional careers and ones that work to prepare students for life, have all conspired to shore up the distinction between the liberal and the illiberal arts and so served to give reflective questioning into technological systems, artifacts, and the principles and processes of design a status on the sidelines of the culture of inquiry within liberal education in America.

Much more could be and has been said regarding how we got from there to here; for sheer acuity of insight and narrative persuasiveness Francis C. Oakley’s volume Community of Learning: The American College and the Liberal Arts Tradition (Oxford University Press, 1992) especially stands out, and perhaps we will have time in the discussion for more consideration of this complex trajectory. One wonders for example whether, in placing the importance that we do on the development of students as autonomous thinkers, with the competencies
to approach a wide gamut of information with “benign skepticism” in order to form independent judgments about its worth, we have overlooked the need in liberal education to attend more closely to ways in which, as the renowned Scottish moral philosopher Alasdair MacIntyre has put it, the “virtues of independent rational agency” need to be supplemented by the “virtues of acknowledged dependency”—a dependency that can be understood as involving not only other people but also the technologies that fill our lives.3

But, having gotten from there to here, the question of how to integrate engineering with liberal education demands we give our utmost consideration to how we could move away from the here where we are now to a different there, one that would be more commodious with regard to recognizing engineering as one of the liberal arts not only because of practices already present or taken to be highly desirable within undergraduate engineering education, but also with regard to the need to increase opportunities for making technology qua technology a more deliberate object of study within liberal education. In this new place, the reflective understanding of technology and an awareness of our interdependence on things as well as on other people would be addressed as key student learning goals within liberal education as a matter of course rather than the exception, and the principle that in growing more knowledgeable about technology, we become more knowledgeable about ourselves would be accepted more widely.

In short, as I indicated earlier, I believe there is much to be gained from considering the integration of liberal education and engineering as a two-way street, as an integration that would involve changes in both cultures, changes that would promote a greater sense of academic cosmopolitanism. By ‘cosmopolitanism’ I have in mind an attitude characterized, as Kwame Anthony Appiah described it in a brief but powerful work by the same name, by curiosity, delight in the discovery of new things, and an ability to connect with individual others through the sharing of mutual interests.4 For engineering and non-engineering students alike, questions about technology can offer a critical point of contact and connection. As Appiah observes, in the context of human social life, once individuals become able to establish a single point of contact, the possibility opens up for further connection through “discovering things that are not yet shared.” What Appiah says about human social life could be said as well about the microcosm of human social life that is the life of the academy. Broad, far-reaching questions about technology, embedded in the coursework within liberal education, can serve to help integrate engineering with liberal education and stimulate the joys of discovering further points of contact in a setting marked by pluralistic points of view.

As I have been suggesting, for this integration to take place to the fullest, in the spirit of dialogue that could be seen as a hallmark of academic cosmopolitanism, the liberal arts themselves are in need of some measure of renewal and reform that would allow for closer connectivity to engineering education. In more concrete terms, though, what would this mean?

In the course of gathering my thoughts together in preparation for giving this presentation, I found myself drawn to considering the question of whether it might mean that just as engineering education needs to become more like the liberal arts to adequately prepare the next generation of engineers, a liberal education should become more like one in engineering, that is, more infused with a technical or quantitative

3See MacIntyre’s Dependent Rational Animals: Why Human Beings Need the Virtues (Open Court, 2001).

4Cosmopolitanism: Ethics in a World of Strangers (W. W. Norton, 2006).
approach to inquiry, or with more courses in mathematics and science as part of distribution or graduation requirements, or more reflective of more specialized courses in say the ethics or the history of technology. But, as I continued to think about integrating liberal and engineering education from the perspective of an academic cosmopolitanism analogous to the cultural cosmopolitanism of which Appiah speaks, I came to the conclusion that at least at this point in time it is more important to establish tighter connections than parallel convergences between the cultures of engineering and the liberal arts. One way of establishing such a connection is for current and future generations of engineers to be more adept in the skills and competencies of the liberal arts. Another and complementary way of establishing this connection is to build more opportunities within liberal education for close reflection on technological content—the products of engineering design as tools and technological systems, and the principles of technological design. Without a greater emphasis on these objects of inquiry, particularly in the humanities, we are in a position of graduating students with a liberal education who are at a substantial disadvantage when it comes to taking on the task of understanding and interpreting the fundamental character of the times in which they live—and if any task can be said to belong to the liberal arts, that one certainly does. In the spirit of academic cosmopolitanism, then, I want to offer a few concrete proposals—five in all, in no particular order except the last, some micro in scope, others far wider—for how within the context of a contemporary liberal arts education more opportunities for closer reflection on technology might be built.

First, as programs continue to be spawned that cross the lines of disciplinary citizenship within liberal education, it would serve us well to be attuned to creative opportunities to incorporate inquiry related to technology and its social impacts. While Science, Technology, and Society programs have traditionally been the primary home for such interdisciplinary questioning and will continue to be for the foreseeable future, we could say that wherever an interdisciplinary program concentrates on understanding the relations of humans to one another or of understanding the relation of humans to planet Earth, an opportunity awaits for purposive attentiveness to the relations of humans to machines and tools, as all of these relations are deeply intertwined and complicit with one another. Programs in sustainability studies are natural places for such questioning, and I will have more to say about that shortly; but there is also a role to play for inquiry into technology in programs that many of us are seeing emerging and flourishing on our colleges on global citizenship or human rights and humanitarianism.

On a much smaller level, another potential avenue for change within liberal education that could result from drawing it and engineering education into closer dialogue with one another lies in revising the scope of courses in engineering ethics. Among the presentations given during the 2007 Workshop on Philosophy and Engineering in Delft and the 2008 Workshop in London were ones on the need to re-vision the content of undergraduate engineering ethics classes so that they could be, and I quote here from Ed Harris of Texas A&M, more “aspirational” than “preventative” in nature. If engineering were seen as one of the liberal arts, such re-visioning would be easier to achieve. Undergraduate engineering ethics courses could be freed up from having a key focus be on whistle-blowing, misrepresentation, conflicts-of-interest, and other issues central to the practices of professional engineering, in order to make way for a much broader set of ethical considerations relating to the responsibilities of engineers, as designers of sustainable futures, to contribute to human well-being.

Expanding on this, thinking of engineering as a liberal art would not only help in reimagining approaches to teaching
engineering ethics, but also in re-envisioning the structure of the standard ethics curriculum within philosophy itself.

A typical ethics curriculum in philosophy is stacked like a trapezoid. It begins with a broad-based introductory course that focuses on normative ethical theory and questions of metaethics—for example, what is the meaning of the word ‘good’?—with perhaps some passing consideration of issues in applied ethics. In the middle of the trapezoid are applied ethics courses. Coming into prominence and respectability within the philosophy curriculum in the late 1970s, the decade in which the Supreme Court made decisions on Roe v. Wade and Regents of the University of California v. Bakke, such courses developed as normative-based examinations of contested contemporary social issues, most often those relating to life and death: abortion, euthanasia, capital punishment, distributive justice, and animal rights. Specialized courses in the “ethics of x”: medical ethics, bioethics, environmental ethics, engineering ethics, information ethics, and the like, tend to be found toward the top of the ethics trapezoid, along with courses in contemporary ethical theory. No one in this room will be surprised, I imagine, if I were to suggest that consideration of ethical issues related to technology ought not to be sequestered in specialized courses but should be introduced at a point much earlier on. And, in introducing these issues at an earlier point, I would argue that an important aim of the liberal arts—that of getting students to become better skilled at identifying and framing ethical problems themselves, to build their capacity for ethical inquisitiveness, including an ethical inquisitiveness for issues arising organically out of their own lived experience with technology—might be more easily attained.

Such a model of a philosophy ethics curriculum would still resemble a trapezoid, but one broader and more flattened-out. In his examination of the relationship between technology and agency, What Things Do (English translation, The Pennsylvania State University Press, 2005) Peter-Paul Verbeek cites the innovative work of the Netherlands industrial design company Eternally Yours. While the aim of Eternally Yours is similar to that of a number of companies in the interest it has taken in designing products from a low-waste standpoint, it does not approach such design through the question of how to incorporate biodegradable materials into the functionality of particular tools. Rather, it starts the design process from the assumption that people hang on to consumable objects rather than throwing them away because they develop psychological attachments to them, based on particular physical properties that these objects have. The key then in the design process is to identify what these particular properties are and incorporate them into the making of things.

One can imagine, then, as part of a broader base of the ethics trapezoid, an introductory ethics course that would combine reflective inquiry into normative ethical theory along with inquiry into concepts and principles of design, guided by the assumption that objects help to shape our ethical relations to the world and the goods we choose to pursue. Playing on the theme of Eternally Yours, one could ask: How might green buildings be designed so as to inspire those who live and work within them to generate less “waste” of the kind that cannot go into a landfill: less waste of people’s time, less waste of words in conversation with others, more attentive dealings with others, in other words, along Kantian lines as persons rather than things? Put that question together in the classroom with an exploration of deontological ethical theory, and you have Respectfully Yours. Replace Kant with Aristotle, and Virtuously Yours emerges. And so forth and so on.

A pointer to a fourth change that could take place within liberal education so as to make it more responsive to the demands of our technological age can be found in an October 20th, 2006 essay by Frank H. T. Rhodes, President Emeritus of Cornell,
published in the *Chronicle of Higher Education* under the suggestive title “Sustainability: the Ultimate Liberal Art.” Concerned that we are preparing the professionals of the future in a wide variety of fields, engineering among them, with an insufficient knowledge of historical and other perspectives drawn from the liberal arts, leaving them ill-equipped to think about the demands of the present age, Rhodes proposes we take sustainability as, and I quote, “a new foundation for the liberal arts and sciences.” The broad parameters of a curriculum in sustainability would involve coursework in the natural and physical sciences, the social sciences, arts, and humanities....along with, and here I quote again: “some review of the practical arts, of technical discovery and invention.”

In short, sustainability could provide, to turn to the theme of one of the break-out sessions, an intellectual paradigm for talking about the integration of liberal education with engineering, one that would recognize engineering as a liberal art while at the same time reclaiming a coherency for liberal education that it once had when its subject-matters were those of the trivium and the quadrivium. That, though, is not the particular change I had in mind in bringing up Rhodes’ essay. Without ever mentioning the subject directly, his reflections also point to a need to consider how the objectives of arguably the most fundamental commitment of liberal education, namely, its commitment to critical thinking, might itself benefit from a widening of focus, even if sustainability were to serve as one but not as the foundational paradigm for a liberal education.

In particular, Rhodes notes that sustainability is marked by a complexity full of “approximations, assumptions, projections, extrapolations, and ambiguities.” We tend to associate the practice of critical thinking with the growth of individual autonomy as marked by independence of mind and the development of clear reasoning and forms of expression. Seen in this light, ambiguity along with vagueness becomes something to recognize and avoid. We don’t normally put clear reasoning in the same breath with efforts to become more cognizant of tracing out the inevitability and even the desirability of ambiguity in a situation, nor do we necessarily put such reasoning in the same breath as developing an understanding of how broad the complexity involved in a particular matter might be. We know that unpredictability tends to follow complexity, and that the relations among an intended design, its materiality, and the uses to which it is put, as the philosopher of technology Don Ihde notes in “The Designer Fallacy and the Technological Imagination,” generates multistability and consequences that cannot be controlled for or known in advance.5 Layering in a greater focus on ambiguity, complexity, as well as unpredictability into the contours of critical thinking courses might be able to make a difference in helping students acquire perspectives and habits of mind that will better help them address challenging problems in which the role technology has to play is key to their successful solution.

I could go on expanding this list of ways that liberal education might be renewed by virtue of a more purposive engagement with technology as a subject-matter for thought. Let me now though return to the subject of happiness, as I promised I would, in order to close out this list with one more way that integrating engineering with the liberal arts can provide an opportunity for the liberal arts to reflect upon as well as to renew its own present practices. Succinctly put, thinking about engineering as a liberal art could pave a way for liberal education to reclaim its curricular engagement with those deep, daunting and enigmatic questions that we as humans perpetually ask about

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5In *Philosophy and Design: From Engineering to Architecture.*
ourselves, including ones related to happiness and the matter of a good life.

Just as we can entertain the idea of finding a new intellectual paradigm for liberal education in the shape of broad academic inquiry into sustainability, we could also entertain the idea of finding a new intellectual paradigm for liberal education in the form of the growing field of happiness studies. Students pursuing coursework in happiness studies would have the opportunity to become fluent with the approaches of a wide array of disciplines, including but not limited to biology, cognitive science, neuroscience, economics, sociology, the fine arts, religious studies, philosophy, and within the latter field the emerging subfield of experimental philosophy. They would be able to engage in cross-disciplinary research that, as the Journal of Happiness Studies puts it, would combine “speculative reflection on the good life and empirical investigation of speculative well-being.” Such students would certainly have to be highly informed about technology as well, given that one of the consistently enduring promises of technology is that it can make a substantial contribution to making human lives happier lives. Any student involved in the pursuit of happiness studies would find him or herself encountering difficult and complex questions about happiness from a number of different perspectives. What is happiness? What, in general, do people need in order to be happy? How can I design my life so that I can maximize my own happiness? Is it even possible to predict and to plan for what would make me happy, or is happiness more often simply, as the title of the book by Daniel Gilbert indicates, something that I stumble upon? And, if I can’t really know what can make me happy, what are the implications for being an autonomous actor within a liberal society and for liberal education in general?

Even if one were not to prompt these questions through the development of undergraduate programs in happiness studies, it is extremely important for such questions and others like them to be raised in a curricular setting, for liberal education to reclaim inquiry into broad questions of meaning and value. All of us here know that traditionally much of the work of engineering has been directed toward improving human well-being by creating tools or infrastructural innovations that, in substituting for human labor, have been able to lift some of the burdens associated with the human condition. For example, as Nicholas Carr notes in The Big Switch: Rewiring the World, From Edison to Google, General Electric’s 1920s publicity campaign for home electrification included a pamphlet, “The Home of a Hundred Comforts,” containing the claim that a wired house would do the same amount of work as ten household employees. And, of course, not only an exchange of human for machine labor is at stake in this understanding of the value of engineering, as the traditional measure of an automobile’s “get up and go” in terms of horsepower shows. There is much work for the engineers of the future to do to within this horizon of understanding engineering’s purpose, from developing mechanisms for the provision of clean and safe drinking water to all the world’s population to creating carebots which, in combination with sensor technologies, would be able to instantaneously locate and retrieve the innumerable remote controls and other technological devices the millions of us in the baby boom generation will manage to misplace as we age.

The need to ensure a sustainable future for generations to come puts a special and urgent onus on such work. To quote Frank H. T. Rhode again from the essay I cited earlier, the goal of sustainability is to ensure we “preserve with minimum disturbance earth’s bounty—its resources, inhabitants, and environments—for the benefit of present and future generations alike.” That expression of the aim of sustainability, taken from the Bruntland Commission’s 1987 report, is geared toward preserving the resources we have for future generations
who we assume will want and desire the same goods as we do now. But what if future generations will have different interests and want different things? What happens if we focus the aperture of our inquiry into the integration of engineering and liberal education on taking into account contemporary developments within engineering itself that are themselves integrative in nature—the converging technologies formed by the unity of nanotechnology, bioengineering, information technology and cognitive science that are oriented toward enhancing human performance or transforming the human condition? What if through the development of brain-machine interaction, neuromorphic engineering, and the like, humanity itself becomes the object of the design process? What happens when the technology R us?

While these developments would be quite helpful to the admissions offices in our colleges—we could always count on having a viola player or a soccer goalie in the first-year class—the ethical issues that the NBIC technologies raise are unprecedented in their character and scope. How will we decide what to do when what we can do, as Richard Hull once put it, far outstrips what we can know? From where will we draw the principles that will allow us to make these decisions? Such developments in engineering are opening up very broad and very deep philosophical questions; and liberal education needs to respond by renewing its interest in and capacity for sustained thinking about them. In this regard, integrating liberal education and engineering can be seen as not only desirable but acquires the force of a moral imperative.

Let me conclude by pulling together the themes I have been stressing. I believe we stand at an unprecedented moment within the history of liberal arts in America. We have the possibility of joining the practical and the philosophical in mutually informative dialogue with one another in an undergraduate liberal arts educational setting. Such dialogue could also promote greater understanding of the interdependencies among the practical and the philosophical, among engineering and the liberal arts, of the ways in which these forms of inquiry are “in it together,” one could say; and, much like bookends, are complementary to one another. On the one hand, innovations in engineering increasingly have the ability to shape what it is that we value and potentially the ability to shape us as valuers of things. On the other, much of what we care about and value, originating from the work of many thinkers within the tradition of the liberal arts, does not stand outside the process of engineering design but rather is always reflected within it. By recognizing the mutual interdependency of these modes of inquiry, we put ourselves in a much better position to work together to bring about the kinds of changes that we need to make to ensure the ability for those who will come after us to continue to live from and depend on the things of this earth.
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