

Farewell Comments: "STEM and the Humanities:
a Misconceived Dichotomy"

Jim Leach

Former Chairman

National Endowment for the Humanities

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President Yu, Chairman O'Donnell, Chairman Watson, Scholars, Friends:

At the risk of presumption, I would like to review the state of the humanities at a time when a misconceived psychological cleavage is fast developing between the humanities and the STEM disciplines.

Bizarrely, a potential rupture may be emerging that could affect our quality of life and, potentially, American leadership in the world. My thesis is that the humanities and fields of inquiry related to science, technology, engineering and math are complementary rather than competitive. Each set of disciplines is essential. Each bolsters the other. Indeed, the humanities without STEM define economic stagnation, and STEM without the humanities could precipitate social disaster.

Before developing this thesis, let me underscore that it was on the assumption "democracy demands wisdom" that the 1965 statute establishing the National Endowment for the Humanities laid out a citizenship challenge: to provide the perspective of the humanities "to the current conditions of national life." Over the course of almost half a century few federal agencies have done more with less. Since its inception the NEH has facilitated over a billion words of scholarship involving thousands of books, dozens of which have won Pulitzer, Bancroft and other prestigious scholarly prizes. Likewise, based on the 50,000 programs put on each year by its affiliated state councils and the multi-million viewership of the documentary films it supports, the NEH has become the largest humanities outreach organization in the world.

Governmental involvement in cultural activities, even basic research, has a

tendency to be controversial. Discussions about STEM and the humanities, for instance, are not new.

Half a century ago the English physicist and novelist C.P. Snow delivered a controversial lecture at Cambridge University called "The Two Cultures" in which he lamented the gulf between scientists and a group he described as "literary intellectuals." He cited several examples – scientists ignorant of the social insights of Dickens and humanists ignorant of the second law of thermodynamics.

With acknowledged exaggeration, the gulf Snow depicted might be described as illiteracy matching innumeracy in the citadels of academia. But however defined, Snow held that the breakdown of communication between the sciences and the humanities hindered solutions to social problems. Assuming some legitimacy to this contention, what is the situation five decades later?

In many ways the science-humanities distinction is more complicated today as advances in physics, biology and chemistry have become more complex. Nonetheless, from a methodological perspective, the technological revolution that began with the development of the point-contact transistor and thence the digital electronic computer, the integrated circuit, and the microprocessor has found the humanities and sciences sharing a growing portion of common ground.

Just as computers allow mathematical computations applied to scientific inquiry to be made at blinding speed, so the digitization of images of a myriad of pictures and objects and billions of words harvested from books, journals, and documents enables the application of scientific methods to vast amounts of cultural and social science data. Indeed, the new research tools that STEM has wrought have spawned a new academic field called the digital humanities which is defined by process techniques rather than area of study.

Based on research originally pioneered at Bell Labs and universities like Illinois, M.I.T., Princeton, Iowa State, Stanford, and Penn, commercial firms such as Hewlett-Packard, IBM, Intel, Microsoft, Apple, and Google have been given the opportunity to advance new kinds of consumer products and services. As a consequence, the revolutionary hallmark of our times is the emergence of a New Digital Class, characterized less by occupation, birth, geographic location, and the science-humanities divide than by an individual's degree of curiosity, diligence and access to digital technology.

The important division in the new communications age is no longer the one between science and the humanities. It is in the first instance the growing gulf between those who have crossed the digital divide and those who by choice, lack of access or capacity have not; and in the second, between those who seek information from diverse sources with an open-minded perspective and those who choose to rely on single-dimensioned purveyors of views.

Since the Enlightenment, the issue of equality has been viewed as a political ideal tied to democratic institutions and governmental policies of the moment. But in the modern world access to knowledge is becoming as central to advancing social equality and opportunity across the globe as access to the ballot box has proven to be the key to advancing political rights.

The question of whether a tweeting world will cause greater understanding and social integration at the community and international level or lead to greater intolerance and social splintering is yet to be resolved. What is clear is that few revolutions in history can match the democratizing consequences for individual learning of the development and spread of digital communication devices and the software capacities that fuel use of such hardware.

If a wide-eyed creature sitting on the moon this last century were assigned the task of assessing what constructive happenings had occurred on earth, that creature would have to conclude that the most impressive achievements of man in this period of world wars, religious and ideological conflict clearly has been in the STEM disciplines. Conversely, these advances have also added to the vulnerability of humankind.

After all, at the same time that the capacity to compute and correlate, heal the sick, communicate to the most distant corners of civilization, and travel around the earth, even into outer space, has leaped forward, the power to destroy and do harm has also grown exponentially. For the first time in man's existence, the capacity exists not only to wage war but to destroy life on the planet. As Einstein so presciently warned, splitting the atom has changed everything except our way of thinking.

Vulnerability is now the state of man, everywhere.

Civilization is jeopardized at one end by weapons of mass destruction and environmental degradation, and at the other by hatred-driven anarchy. For the first time in history terrorism has been globalized and asymmetric warfare

computerized. Just as a plot was hatched against America on 9/11 from a mountainous redoubt halfway around the world, cyber-attacks may with increasing ease be launched from distant computer "silos." In less than a decade the United States has become vulnerable to foreign powers or galvanized groups capable of wreaking havoc on our economic infrastructure – everything from the electric grid to the financial system – without an army being mobilized.

The national security dilemma of our age is that the more advanced and open a society, the more exposed it is to anarchistic acts.

Man's fate has never been more interwoven with unprecedented security challenges. Optimism can only be presumed if STEM advances are coupled with greater humanistic understanding. Calculus and physics require a linkage to history and ethics. Together, STEM and the humanities flourish; apart society is jeopardized.

The sciences cannot ignore the humanities any more than the humanities can ignore what science has wrought.

What may be counter-intuitive to many is that the challenges in the humanities exceed those of STEM. This is the case because grasping and sharing the art of human understanding is vastly more difficult than mastering the technology embedded in smart phones and the most powerful computers. Love and hate, beauty and fear are more complex than high speed algorithms and non-Euclidean geometry.

There is every reason to honor the sciences and support investigations into the unknown, be they related to the beginnings of the universe or the extending of human life. Yet, in the end, dark matter and dark energy may be easier to understand in the physical sciences than dark motives are in the social arena. The Higgs boson has been identified and, perhaps by extrapolation, found, but peace on earth has not been secured.

The bottom line case for humanities studies is thus a risk management one – the necessity of developing the wisdom, policies and tools to avoid the apocalypse. The only credible methodology to secure and ennoble life on the planet is to build habits and techniques of conflict resolution that do not involve recourse to violence at every level of social interaction.

Accordingly, stewards of national power – and in a democracy that means all of us – have no choice except to strive to understand more fully the human condition. Livelihoods and life itself demands attention to wide horizons and, now and again, deep fissures. As important as controversies of the day, politics of the moment, may be, they are generally surface concerns. To understand problems on the surface it is necessary to know the depths below: the history and culture of one's own society and that of others, even the most distant.

Just as we need an infrastructure of roads and bridges, we need an infrastructure of ideas. As the legislation establishing the NEH affirms: "The world leadership which has come to the United States cannot rest solely upon superior power, wealth, and technology, but must be solidly founded upon worldwide respect and admiration for the Nation's high qualities as a leader in the realm of ideas and of the spirit."

Yet, there appears to be a gathering sentiment, symbolized by recent initiatives in the political arena that higher education should move away from an emphasis on the liberal arts to teaching discrete job skills. The assumption that jobs are the number one issue for most Americans is valid; a conclusion, however, that the humanities are not central to job creation is mistaken. Indeed, such a conclusion could too easily lead to policy prescriptions that undercut American competitiveness and the national interest itself.

A myth of our times is that the humanities are good for the soul but irrelevant to the pocket book. Actually they are central to the creation of jobs and long term American competitiveness.

Testifying before Congress a year ago, Hunter Rawlings, President of the Association of American Universities, noted that a survey of employers by his association indicated that 73%, rejected the trend towards narrow technical training and wanted colleges and universities to place more emphasis on critical thinking and analytical reasoning. A more recent study done by the Association of American Colleges and Universities found that 78% of employers preferred job applicants knowledgeable about global issues and societies and cultures outside the U.S.; 80% found written and oral communication key; and 82% favored those with civic knowledge, skills, and judgment essential for contributing to the community and to our democratic society.

It is true that many jobs such as in the building trades are skill-centric, but job creation itself requires leadership which in turn requires an understanding of

community and the world. Change and its acceleration characterize the times. With each passing year jobs evolve, become more sophisticated. Training for one skill set may be of little assistance for another. On the other hand, studies that stimulate the imagination and nourish capacities to analyze and think outside the box are well-suited to the challenges of change. They make coping with the unprecedented a manageable endeavor.

What is needed in a world in flux is a new understanding of the meaning of the basics in education. Traditionally, the basics are about the three "R's," which in my state of Iowa are sometimes defined as "'readin, 'ritin, and 'restlin." However defined, they are critical. Nonetheless, they are insufficient. What are also needed are studies that provide perspective on our times and foster citizen understanding of their own communities, other cultures, and the creative process.

To understand and compete in the world we need a fourth "R," what for lack of a precise moniker might be described as "reality" – which includes not only relevant knowledge of the world near and far but the imaginative capacity to creatively apply knowledge to discrete issues and undertakings.

Rote thinking is the standard of the status quo. Stimulating the imagination is the key to the future. As Einstein once observed, imagination is more important than knowledge, and his life is proof of the imaginative mind trumping skill-set knowledge. In a math-based science, Einstein was never considered a first tier mathematician. But he was an unparalleled imaginer. In pondering self-initiated thought problems he probed the meaning of the universe.

As individuals each of us tries to make sense of our own odysseys through life. Our universe is small in relation not only to the solar system but the communities in which we live. But wherever we might be, we are affected by global events, whether related to the challenges of national security or the global hiring hall. In this insecure geo-political environment, a deeper comprehension of the fourth "R" (reality) has never been more important.

What better way is there to apply perspective to our times than to study the history of prior times? What better way is there to learn to write well than to read great literature? What better way is there to think critically and understand American traditions than to parse the thinking of Enlightenment philosophers like Locke and Montesquieu and review their influence on our founders and our Constitutional system? And, do not art making and art appreciation instill a sense for the creative process?

The principal rationale for humanities studies is that they enhance the meaning of life and embellish what it means to be human. This rationale is so powerful that it too easily obscures the utilitarian case which is also compelling.

How can we compete in our own markets if we don't understand our own culture and its enormous variety of subcultures, or abroad if we don't understand foreign languages, histories and traditions?

How can we understand our own era and the place of our own values if we don't study other faith systems – Buddhism, Hinduism, Islam and the relationship of diverse religions to the Old and New Testaments?

How can we contain prejudice and counter forces of hatred if we don't come to know more about each other?

How can we undergird our civic institutions and precipitate sound public policy if we don't understand the rights and responsibilities of citizenship?

The dilemma of today's politics is that America has an abundance of leadership in commerce, science, the arts and every facet of the academy but the political system is hamstrung by ideological cleavages. President Eisenhower warned years ago of a military-industrial complex. Today my worry is more about the rise of a money-driven "political-ideological complex." Ideologues use politicians as pawns while politicians use ideologues as enablers of personal ambition. This reinforcing set of mutual interests has little to do with the common good and much to do with the break-down in civility in public life.

Yet seldom has it been more important for individuals in the public arena to constrain embittering conflicts of interest and appeal to the better angels rather than the baser instincts of the body politic. Whether the issues are social or economic, domestic or international, the temptation to appeal to the darker side of human nature must be avoided. The stakes are too high. The health of nations is directly related to the temperance of statecraft, to whether public officials inspire hope or manipulate fear.

A skeptic once suggested that the humanities are little more than studies of flaws in human nature. Actually they uplift on the one hand and warn on the other. The power of a few to commit acts of social destruction and the contrasting capacity of a few to precipitate uplifting change has grown exponentially in the last century.

A race between these contrasting capacities is gathering momentum.

For the best of our values to prevail, Americans must awake from historical slumber. A renewed emphasis on the study of various humanities disciplines, especially history, is vital because of our unique role in the world and because academic testing tells us that Americans have more limited historical and geographic knowledge than virtually any other advanced society.

To look presciently forward we have no choice except to look carefully back.

History has a circular quality. It tends to repeat, sometime rewind. Wisdom, by contrast is linear. Smart people, parents tell their children, learn from their own mistakes. A really smart person, a corollary might suggest, learns from the mistakes of others. And a sage gleans great truths from the wise as well as mistaken steps of those who came before.

Every circumstance is, of course, different than any other. We don't ever walk in exactly the same way in the same physical or social environment. People and situations change. Hence it is important to think imaginatively as well as pragmatically and historically, and in the complexity of political life to recognize that seldom is there only one proper path determinable by one individual, one political party or one country.

Whether a person knows a great deal or very little, caution should be taken about being certain of very much. To know a lot may be a preferable condition to knowing little, but the best and the brightest are not immune from great mistakes. Imperfect judgment characterizes the human condition. That is why humility is such a valued character trait, and why civility is such an important part of an interconnected world polity.

The most meaningful discovery in a liberal arts education is that everything is related to everything else, although we may not know it at the time. Wisdom involves the tying together of threads of learning. The challenge is to discover and then correlate discoveries, the most important of which relate to perspective: values, methods of thinking and doing, rather than facts.

The insights provided by humanities disciplines and the judgmental capacity to think broadly and correlate cogently which they inculcate are not dismissible options for society. Humanities studies revitalize the human spirit, rev up our

productive engines, and lessen the likelihood of mistake-making in public policy as well as private life.

By perspective, it took several centuries for *Pax Romana* to unravel, less than two generations for Athenian culture to fall from its 5th Century BC pinnacle, and only a couple of decades for two advanced European cultures to become captive to fascist and communist dogma and the numbing liquidation of millions. These monumental political shifts stand as forewarnings for all peoples in all societies and underscore the gravity of our responsibility to each other and to posterity.

In American governance, process is our most important product. We instinctively treasure our democratic values and frequently have trumpeted them as a model for the world. Today our confidence has eroded a bit. In exasperation and more than a little anger, American citizens are increasingly using the adjective "dysfunctional" to describe Washington politics. We have had more difficult times in our history. Far greater political turbulence, for instance, was reflected in the decade leading up to the Civil War. Nevertheless, it is jarring for the public to see political parties seemingly more bent on opposing each other than accepting mutual responsibility for credible governance. There is fair reason at all times for philosophical disagreements to be aired between political factions. But the greater our problems, the more important it is for the political establishment to work out differences related to divided government in an open and respectful manner.

At the moment, America leads the world in almost every academic field, but a crisis is looming in the humanities as publicly supported research has increasingly become focused on laboratories rather than libraries. The key for the future is to establish a responsible balance, one that need not be defined as equality of public research spending. Scientific research, after all, is substantially more expensive than humanistic inquiries. But a balance of concern should be sought that recognizes that the humanities and areas of study included in STEM are intertwined. In his prescient 1950 report *Science the Endless Frontier* which led to the formation of the National Science Foundation, Vannevar Bush recognized the complementary nature of each endeavor. He wrote: "It would be folly to set up a program under which research in the natural sciences and medicine was expanded at the cost of the social sciences, humanities, and other studies so essential to national well-being."

In recent months arts advocates have made a thoughtful case that the letter "a" be added to STEM forming the acronym STEAM to underscore the creative impulses

stimulated across culture by the arts. A vivid example of the tie between the arts and sciences is reflected in a quote from a prominent 19th Century portrait painter, Daniel Huntington, who wrote of his mentor, Samuel F.B. Morse: "Professor Morse's world-wide fame rests... on his invention of the electrical telegraph; but it should be remembered that the qualities of mind which led to it were developed in the progress of his art studies. For Morse, a distinguished painter and founder of the National Academy of Design, every studio was "more or less a laboratory." Similarly, the lives of 18th Century scholars and statesmen who were also scientists and inventors like Benjamin Franklin, Thomas Jefferson, and the Russian polymath, Mikhail Lomonosov, illustrate how the humanities and the sciences are conjoined manifestations of similar creative impulses.

It is sometimes appropriate and helpful to distinguish parts from the whole. Yet the big picture in higher education isn't about pitting parts against each other. The challenge today is to strengthen all the parts to make a greater whole.

Both the acronyms STEM and STEAM have merit, but to provide a fuller balance the academic community might consider unifying in support of itself. At the risk of presumption and cheerful hyperbole, I would suggest that "HUMANASTEAM" might be an appropriate rallying term. It is a conceptualization unlikely to make a dictionary, or even a t-shirt. Nonetheless, a "HUMANASTEAM" thematic fits the times because there simply is no credible basis for intra-collegiate academic conflict.

I have never come across a humanist who does not support the sciences, nor a scientist who does not support the arts and humanities. There are, however, public figures who are expressing grave doubts about the relevance of the liberal arts, even political science which Aristotle described as the highest art. How should the academy respond?

A compelling case would seem to be self-evident for unity rather than division. Humanities scholars should work in concert with artists and scientists and vice-versa.

Accordingly, I would suggest that policy makers in government and administrators in the academy might consider the relevance of the following:

- 1) In the wake of Sputnik the Eisenhower Administration pressed not only for new support for STEM research but for enhanced foreign language training and support for international studies programs. The question of whether the

time is appropriate to press new, expanded legislation modeled after elements of the National Defense Education Act of 1958 is worthy of review. Sputnik underscored the importance of paying enhanced attention to threats emanating from the Soviet Union. Today very different challenges symbolized by 9/11 are evident. They spring from different regions of the world and require responses that must be informed by complex cultural understanding. Public policy options might be enhanced by STEM advances but they will be insufficiently thought through without humanities input.

- 2) It is critical that every American generation have a steady infusion of talented individuals prepared for public service inspired by a public prepared to demand the highest values from its government. A number of universities have spawned public policy schools that are leadership oriented. Universities without such schools might look at models like Syracuse's Maxwell School, Princeton's Woodrow Wilson School, the Harvard Kennedy School, Johns Hopkins SAIS, the Tufts School of Public Policy, Georgetown's School of Foreign Service, the Dole Institute at Kansas, the LBJ School at Texas, the Ford School at Michigan, the Evans School at Washington, the Goldman School at California Berkeley, and the Graham Center for Public Service at Florida. Whether called a School of Public and International Affairs or an Institute for Principled Leadership in Public Service as at Bradley University, where undergraduates are offered the option to minor in Leadership, universities are imaginatively experimenting with cross disciplinary studies that have relevance for business, non-profit, and journalism careers as well as government. Public policy schools are especially important today because of our globalized economy and the tangible nature of the links between the humanities and national security.
- 3) All academic approaches are affected by university and college decision making on courses required and majors offered. Universities might find it helpful to review whether to energize the academy with more cross-disciplinary majors, perhaps modeling on Oxford's *Philosophy, Politics and Economics (PPE)* program. Harvard, for instance, has a similar option but stamped the major with an un-compelling name (*Social Studies*); Northern Arizona University, on the other hand, calls a new program *Philosophy, Politics and Law*. The university administration was surprised with the enthusiasm of the student body when the new major was unrolled a year ago. Many more signed up than expected. Other approaches might involve other combinations of studies in the humanities, social and natural sciences. A

major titled *History, Literature and Philosophy*, for instance, would in affect be a modern version of what *Classics* majors studied about eras that go back several millenia; One titled *Art History, Comparative Religion and the Classics* might be considered an inspired doubling down on the humanities; combining *Psychology and Literature* might lead future clinical professionals to discuss with their patients lessons from literary works; and a major in *Science, Ethics and Politics* could further conjoin humanities and social science courses with STEM education. Many other academic combinations could be considered, perhaps with optional student input. But for disciplines that have not changed as much as the times, the case for experimenting with cross-disciplinary "oomph" would seem compelling.

- 4) Consideration should be given to requiring all undergraduates and perhaps students in graduate business schools to take a full year multi-disciplinary course in World Cultures. Such a course could be envisioned to be history-centric but multi-disciplinary. It might begin, for instance, with an astronomer discussing the 8 billion year history of our universe and then quickly proceed to review the ancient civilizations of the Middle East, China, India, Greece and Rome, and then go through the Middle Ages and the Dark Ages when Muslim scholarship shined, and then the Enlightenment. A second semester could begin with the Western migration to America and end with modern regional geo- politics. The history, politics, literature, philosophy, religion, sociology, archaeology, classics, economics, engineering and science faculties (speaking especially to the history of science and technology) could all be involved. I would be surprised if giving students a sampling of humanities approaches wouldn't open many eyes to the prospect of a humanities major and cause most to find this survey approach the most memorable course they take in their undergraduate years. A World Cultures course of this nature might also be encouraged at community colleges where an increasing number of students are seeking a broader liberal arts background that can be the basis for a transfer after a year or two to other colleges and universities.
- 5) With access to knowledge becoming democratized across the planet by the Internet, MOOCs are suddenly and rightly in vogue. Yet colleges and universities remain the center of American higher education, indeed of American culture. There is no better teaching method than tutored interchanges of ideas, what used to be described as sitting on a log with a mentor. Old-fashioned, labor-intensive teaching matters. There is a thirst in every corner of America for quality cultural programming. This is true in the

creative arts; it is also true in the broader humanities. Everybody in the academy has a role to play. Whether it is with a state humanities council, Osher programming, Clemente courses, or lectures and academic outreach offered at night and on weekends by individual institutions, it is important that America be brought together with shared exchanges of ideas. There is no more effective antidote to uncivil behavior in society than citizen engagement involving models of civil discourse that feature a wide expression of opinions. Such engagement is the daily grist of the academy. Centuries past, the enhancement of citizenship was considered a prime responsibility of the academy. It is even more important today. The academy has to be more than about itself.

- 6) Finally, with institutional pride let me note that over the past half-century the infrastructure model established by the NEH has made an impressive educational mark despite limited resources. This small federal agency has played an instrumental role in spurring humanities research, from bridging cultures studies to enduring issues in philosophy to the new field of digital humanities; it has advanced public programs including thousands of cultural exhibitions and hundreds of world-class documentaries; it has propelled archaeological studies and preservation initiatives; it has supported academic fellowships, conducted summer workshops for teachers, and developed peer reviewed curricula for k-12 humanities studies; it has given impetus to the establishment of a national digital library and to the development of dictionaries like DARE and encyclopedias dedicated to regions of the world and individual states within our borders; it has assisted in the collation and digitization of the papers of Presidents from Washington to Eisenhower, and transformative figures like Martin Luther King, Jr., Jane Addams, Albert Einstein, and Mark Twain; and it has coordinated and helped finance state humanities councils and the thousands of life-long learning programs they put on each year. The NEH is particularly proud of the inter-disciplinary projects it has spurred. In recognition that the humanities have no borders and no single sources of inspiration, the agency has co-sponsored initiatives with other governments, other agencies of our own government, and non-profit institutions. Unfortunately, despite thoughtful support from the administration and a group of stalwart humanities advocates in Congress, the NEH is stretched thin, operating with approximately a third of the resources it had in 1979 inflation adjusted dollars. In this era of splintered politics and globalized economic competition, the question for policy makers is thus straight-

forward: should attention to the humanities be upgraded or should American leadership in the realm of ideas and of the spirit be considered less relevant?

For those inclined to consider the humanities a low priority in a time of imperfectly disciplined budgets, let me conclude by noting that sometimes it is instructive to consider the “what ifs” in the life of a nation.

What if there had been no Vietnam War, no intervention in Iraq, no maintenance of troops in Saudi Arabia in the wake of the first Gulf War, the presence of which was the *cause celebre* of the al-Qaeda plotters who struck the Pentagon and World Trade Center on September 11, 2001? Would America today have a stronger economy, more respected stature in the world? Would there be more security at home and less anti-American hostility around the globe?

We, of course, have no choice except to plug ahead with policy options constrained by contemporary events. But of the many lessons emerging from this decade of strife, one surely is that cultural considerations matter, that humanities research and outreach programs and, most significantly, curricula in colleges and universities, are compelling social investments.

Which brings me to the final “what if.” What if society allows humanities studies to fade in significance?

Absent attention to humanities disciplines, is it not likely that America's capacity to lead the world and manage our own institutions of governance and commerce will diminish?

To fail to study history and ponder deeply what it means to be human, to refuse to contemplate the human condition revealed so resplendently in great literature, and to decline to think through the sources of our religious differences and the ethical and philosophical quandaries of the day is to impoverish our potential for making good decisions. Inevitably, we would magnify the misjudgments of our contemporaries and cut ourselves off from the wisdom of others in the near and ancient past.

We discount the role, indeed the power, of the humanities at great cost and greater risk.

Thank you.