The Boyer Commission

on Educating Undergraduates

REINVENTING

UNDERGRADUATE

EDUCATION:

A Blueprint for America’s

Research Universities

This report is dedicated to the memory of Ernest L. Boyer, President of the

Carnegie Foundation for the Advancement of Teaching until his death in December,

1995, and formerly Chancellor of the State University of New York and U.S.

Commissioner of Education. During a lifetime of enthusiastic and thoughtful

commitment to American higher education, he exhorted, advised, inspired, and

invigorated a generation of academic leaders. His career was an extended

exploration of what it means to be an educated person and how real education is

attained. This report is an effort to continue examining the themes to which he

brought so much.

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Table of Contents

Preface 1

An Overview 5

The University as Ecosystem 9

An Academic Bill of Rights 12

Ten Ways to Change Undergraduate Education 14

 I. Make Research-Based Learning the Standard 15

 II. Construct an Inquiry-based Freshman Year 19

 III. Build on the Freshman Foundation 21

 IV. Remove Barriers to Interdisciplinary Education 23

 V. Link Communication Skills and Course Work 24

 VI. Use Information Technology Creatively 25

 VII. Culminate with a Capstone Experience 27

 VIII. Educate Graduate Students as Apprentice Teachers 28

 IX. Change Faculty Reward Systems 31

 X. Cultivate a Sense of Community 34

Conclusion 37

Appendices

 A. American Research Universities 39

 B. Membership of the Boyer Commission 41

PREFACE

The National Commission on Educating Undergraduates in the Research University

was created in 1995 under the auspices of the Carnegie Foundation for the

Advancement of Teaching. It met for the first time July 27, 1995, at the

headquarters of the Carnegie Foundation in Princeton, New Jersey, with Ernest L.

Boyer, President of the Foundation, presiding.

 Dr. Boyer set the tone for the deliberations by reminding the Commission

that conditions in higher education have changed significantly in recent years:

the American system of higher education has become less elite; students (and

parents) have developed their own, often vigorously asserted, ideas about

education and credentialing rather than accepting traditional modes without

question; a much greater range of undergraduate professional degrees has become

available; the freshman year has too often been reduced to remediation or

repetition of high school curriculum, rather than an introduction to a new and

broader arena for learning. Recognition of those and other changes would form a

starting point for the Commission’s deliberations.

 Dr. Boyer died at the time of the second meeting, on December 8, 1995, and

with his passing, the Commissioners felt impoverished by the loss of his

overarching intelligence and perceptiveness about American education, and at the

same time determined to produce a report reflective of his commitment to these

issues. The Commission was renamed in his memory.

 This report does not enter the continuing discussion of the content of the

undergraduate curriculum—whether there should be more science, more mathematics,

more foreign language, more anything—and it does not address the issue that has

come to be labeled ‘The Canon,’ the body of writings deemed to be the requisite

possession of the educated person. Those matters concern every institution

involved in baccalaureate education. But research universities share a special

set of characteristics and experience a range of common challenges in relation

to their undergraduate students. If those challenges are not met, undergraduates

can be denied the kind of education they have a right to expect at a research

university, an education that, while providing the essential features of general

education, also introduces them to inquiry-based learning.

 The recommendations urged in this report will be controversial; some

administrators and faculty will protest that they are unreachable or

impractical, or that the goals entertained can be achieved by minor adjustments

of existing practice. We realize that not everything in this report is

applicable to all research universities, but we hope these recommendations will

stimulate new debate about the nature of undergraduate education in research

universities that will produce widespread and sweeping reform.

What is a Research University?

the united states has more than 3,500 institutions of higher education. More

than two thousand of them offer only Associate or Bachelor degrees. Of the

remainder, the Carnegie Foundation for the Advancement of Teaching in 1994

classified eighty-eight as “Research I” universities; they are those which

“offer a full range of baccalaureate programs, are committed to graduate

education through the doctorate, and give high priority to research. They award

50 or more doctoral degrees each year. In addition, they receive annually $40-

million or more in federal support.” An additional thirty-seven institutions are

called “Research II” universities: they receive “between $15.5-million and $40-

million” in federal support but are otherwise like the Research I universities.

A list of the Research I and Research II universities is appended to this

report.

 Because of the research universities’ commitment to create new knowledge,

they consider research capability as a primary qualification for appointment,

promotion, and tenure of faculty members, and they pride themselves on having

world-class scholars among their ranks. Significantly, almost all the Nobel

laureates who have identified themselves as professors have been affiliated with

research universities. Of course, outstanding researchers are not limited to

these institutions; nearly all colleges and universities can point to strong

scholars within their departments. But at research universities, these faculty

become a defining element. Research universities also have graduate students and

post-doctoral fellows in far greater numbers than other institutions, since

graduate education is a major component of their mission. Another characteristic

is the requisite research environment, including extensive libraries, well-

equipped laboratories, sophisticated computer capabilities, and, often,

university presses, all housed in appropriate facilities.

 Research universities characteristically have an international

orientation. They attract students, particularly at the graduate level, from

many parts of the world, thereby adding valued dimensions of diversity to the

community. The international graduate students often become teaching assistants,

so their presence becomes a part of undergraduate experience. And many research

universities offer an array of interdisciplinary programs seldom available in

smaller institutions. The graduates of these programs enter diplomatic service

and international journalism, banking, commerce, and technology. They help to

make the names of the American research universities recognized and respected

throughout the world.

 In American higher education, nearly every institution has held racial and

ethnic diversity to be a desirable goal. It is widely recognized that meaningful

association with Americans of varying backgrounds and cultural histories, as

well as contact with international students, adds to the breadth of

baccalaureate experience and may serve long-range social goals of diversity and

racial accommodation. Research universities have made diligent and often

successful efforts to attract and hold students from racial and ethnic

minorities. The large public universities with their lower tuition rates can

promise education and social mobility to numbers of students from lower-income

families of all kinds, and the well-endowed private universities can offer

financial support, often quite generous, to gifted students of every background.

So the campuses of research universities are characteristically heterogeneous

places, polyglot, multi-cultural, and multi-ethnic.

 Most if not all research universities have also recognized a special role

in visual and performing arts. After students learn to use the materials of the

discipline, students in the arts are engaged in independent research throughout

their programs, for every exercise in painting, photography, musical composition

or performance is a problem to be solved as surely as a problem in physics.

Adjunct to their academic programs, universities support a range of public arts

programs, often housed in facilities that rival the best in major cities. These

programs can be the principal components of the cultural life of their

neighborhoods or their regions; their communities as well as their students are

the beneficiaries.

 Differences within research universities are as striking as commonalities.

Most obviously, size varies within wide limits. Public and private institutions

differ so significantly in governance and funding arrangements that they provide

very different learning contexts. At private research universities, from four-

fifths to nine-tenths of freshmen will graduate from the same university within

five years; at public institutions, the number will be closer to two-thirds. In

California, large numbers of students spend their first two years at community

colleges before transferring to the public research campus from which they will

graduate; that pattern is not uncommon in other states. Many public research

universities enroll huge numbers of working students whose graduations

are delayed well beyond five years. As a result, developing a continuum in

curriculum from freshman through senior years is far more difficult at many

public institutions. Students at public universities are also more likely to

come from within the state and are more likely to commute to classes than their

counterparts at the private institutions.

 The character of a research university is strongly influenced by its

setting. Some, such as Cornell or the University of North Carolina at Chapel

Hill, dominate the small cities where they grew up; others, such as the

University of Pennsylvania or Columbia University, take on the qualities of

their metropolitan settings. Some, such as Princeton or Rice, have almost wholly

residential populations; at others, such as the University of Maryland at

College Park or the University of Texas at Austin, the majority

of students, whether local residents or not, live outside the immediate campus.

 The Commission recognizes the pitfalls of generalizing about a group of

institutions so varied as the research universities of the United States. Every

research university in the country could truthfully say that some or many of the

negative characteristics described in this report are not accurate for that

institution. Every institution would claim to take undergraduate education

seriously; the well-financed private institutions can no doubt make that claim

with greatest success. None, however, could demonstrate that it has solved fully

the problems we are assessing here. Some, particularly large public

institutions, believe they do not have the resources they need to customize

baccalaureate education. Some of these institutions have ancient roots; others

are latecomers, bootstrapping their way into the company of far better endowed

universities. But the Commission believes that the problems of undergraduate

education are common to them all.

 None of this is to suggest that one kind of university is superior to

another. Research universities are all complex institutions, cities in

themselves, with diverse, sometimes internally conflicting goals and interests.

They pose challenges to the student who seeks to explore their geography,

intellectual as well as physical. The potential rewards of that exploration are

almost limitless; the challenge to the universities is to make the exploration

not only possible but easily accessible.

REINVENTING UNDERGRADUATE EDUCATION

A Blueprint for America’s

Research Universities

An Overview

In a great many ways the higher education system of the United States is the

most remarkable in the world. The speed with which it developed, its record of

achievement, the extent of its reach, the range of its offerings are without

parallel. And, particularly in the years since World War II, the system has

reached a higher proportion of the national population than that of any other

country. Half of the high school graduates in the United States now gain some

experience in colleges and universities; we are, as a country, attempting to

create an educated population on a scale never known before. The goal of

President Harry Truman’s 1947 Commission on Higher Education, that the system

must provide “the means by which every citizen, youth, and adult, is enabled and

encouraged to carry his education, formal and informal, as far as his native

capacities permit” is accepted as axiomatic.

 In the higher education system in the United States, the research

universities have played a leading role: the country’s 125 research universities

make up only 3 per cent of the total number of institutions of higher learning,

yet they confer 32 per cent of the baccalaureate degrees, and 56 per cent of the

baccalaureates earned by recent recipients of science and engineering doctorates

(1991-95). Their graduates fill the legislatures and board rooms of the country,

write the books we read, treat our ailments, litigate our issues, develop our

new technologies, and provide our entertainment. To an overwhelming degree, they

have furnished the cultural, intellectual, economic, and political leadership of

the nation.

Undergraduates Too Often Shortchanged in the Past

Nevertheless, the research universities have too often failed, and continue to

fail, their undergraduate populations. Tuition income from undergraduates is one

of the major sources of university income, helping to support research programs

and graduate education, but the students paying the tuition get, in all too many

cases, less than their money’s worth. An undergraduate at an American research

university can receive an education as good or better than anything available

anywhere in the world, but that is not the normative experience. Again and

again, universities are guilty of an advertising practice they would condemn in

the commercial world. Recruitment materials display proudly the world-famous

professors, the splendid facilities and the ground-breaking research that goes

on within them, but thousands of students graduate without ever seeing the

world-famous professors or tasting genuine research. Some of their instructors

are likely to be badly trained or even untrained teaching assistants who are

groping their way toward a teaching technique; some others may be tenured drones

who deliver set lectures from yellowed notes, making no effort to engage the

bored minds of the students in front of them.

 Many students graduate having accumulated whatever number of courses is

required, but still lacking a coherent body of knowledge or any inkling as to

how one sort of information might relate to others. And all too often they

graduate without knowing how to think logically, write clearly, or speak

coherently. The university has given them too little that will be of real value

beyond a credential that will help them get their first jobs. And with larger

and larger numbers of their peers holding the same paper in their hands, even

that credential has lost much of its potency.

 These are not problems that have been totally denied or ignored; there is

probably no research university in the country that has not appointed faculty

committees and created study groups or hired consultants to address the needs of

its undergraduates. There have been results: new courses, new majors, revised

curricula. A new study by the Center for Instructional Development at Syracuse

University suggests that universities believe they are now giving more attention

to teaching. At a sample of eleven research universities, deans, department

heads, and other administrators said more emphasis was being given to teaching

than five years ago.

Radical Reconstruction

Even so, for the most part fundamental change has been shunned; universities

have opted for cosmetic surgery, taking a nip here and a tuck there, when

radical reconstruction is called for. Serious responses to complaints about

undergraduate teaching have generated original and creative pedagogical and

curricular experiments. But too often bold and promising efforts have vanished

after external grant support disappeared, have withered on the fringes of the

curriculum, or have been so compromised that their originality has been lost.

Strikingly, the Syracuse study reported that research productivity was still

given “much more” weight in making decisions about promotion and tenure of

faculty members than was teaching effectiveness.

 The way the research university developed made the present-day situation

predictable if not inevitable. The inspiration was the German universities of

the nineteenth century, which had redefined themselves as institutions dedicated

to advanced research on scientific principles. America’s leading colleges

adopted parallel goals and began giving advanced degrees, finding honor,

excitement, and reward in the exploration of intellectual frontiers made by

their faculties. In a country and an era fascinated with discovery and

expansion, the research mission has overshadowed the earlier collegiate function

of training young men to be ministers, lawyers, and gentlemen. The older

function had to be maintained, but the undergraduate experience given the young

men, and later the young women as well, was kept isolated from the research

activity and still cast in the pre-university mold. Universities on the whole

did not see ways to integrate their undergraduates into the research missions

that they valued above all else. As Ernest Boyer said in his Scholarship

Reconsidered in 1990, “the focus had moved from the student to the

professoriate, from general to specialized education, from loyalty to the campus

to loyalty to the profession.” Advanced research and undergraduate teaching have

existed on two quite different planes, the first a source of pleasure,

recognition, and reward, and the latter a burden shouldered more or less

reluctantly to maintain the viability of the institution.

Defining Worth

The primacy of research within the espoused missions of American universities is

attested over and over within the academic world. The standing of a university

is measured by the research productivity of its faculty; the place of a

department within the university is determined by whether its members garner

more or fewer research dollars and publish more or less noteworthy research than

other departments; the stature of the individual within the department is judged

by the quantity and quality of the scholarship produced. Every research

university can point with pride to the able teachers within its ranks, but it is

in research grants, books, articles, papers, and citations that every university

defines its true worth. When students are considered, it is the graduate

students that really matter; they are essential as research assistants on

faculty projects, and their placement as post-doctoral fellows and new faculty

reinforces the standing of the faculty that trained them. Universities take

great pleasure in proclaiming how many of their undergraduates win Rhodes or

other prestigious scholarships and how many are accepted at the most selective

graduate schools, but while those achievements are lauded, too many students are

left alone to pursue them. And the baccalaureate students who are not in the

running for any kind of distinction may get little or no attention.

 Why, then, should baccalaureate students give their loyalty and their

money to research universities? Because the potential remains for acquiring a

virtually matchless education. The research universities possess unparalleled

wealth in intellectual power and resources; their challenge is to make their

baccalaureate students sharers of the wealth. To realize their potential means a

complete transformation in the nature of the education offered.

A New Model

What is needed now is a new model of undergraduate education at research

universities that makes the baccalaureate experience an inseparable part of an

integrated whole. Universities need to take advantage of the immense resources

of their graduate and research programs to strengthen the quality of

undergraduate education, rather than striving to replicate the special

environment of the liberal arts colleges. There needs to be a symbiotic

relationship between all the participants in university learning that will

provide a new kind of undergraduate experience available only at research

institutions. Moreover, productive research faculties might find new stimulation

and new creativity in contact with bright, imaginative, and eager baccalaureate

students, and graduate students would benefit from integrating their research

and teaching experiences. Research universities are distinctly different from

small colleges, and they need to offer an experience that is a clear alternative

to the college experience.

 It is obvious that not every student should, or would wish to, attend a

research university. Without attempting to characterize students at other kinds

of institutions, it might be said that the undergraduate who flourishes at a

research university is the individual who enjoys diverse experiences, is not

dismayed by complexity or size, has a degree of independence and self-reliance,

and seeks stimulation more than security. A research university is in many

important ways a city; it offers almost unlimited opportunities and attractions

in terms of associations, activities, and enterprises. But as in a city, the

requirements of daily living may be taxing, and sorting out the opportunities

and finding like-minded individuals may be difficult. The rewards of the

ultimate experience, however, can be immeasurable.

THE UNIVERSITY AS ECOSYSTEM

Albert Einstein once articulated what many scholars have felt in their own work:

The history of scientific and technical discovery teaches us the human race is

poor in independent thinking and creative imagination. Even when the external

and scientific requirements for the birth of an idea have long been there, it

generally needs an external stimulus to make it actually happen; man has, so to

speak, to stumble right up against the thing before the right idea comes.

Research universities provide the context in which the external stimuli operate

with the greatest effectiveness, in which stumbling against the thing should

happen with the greatest ease and frequency. The interaction of many kinds of

stimuli creates at a university a special kind of intellectual environment, with

the health of the whole a manifestation of the health of each part. That

environment should become an intellectual ecosystem. Universities are

communities of learners, whether those learners are astrophysicists examining

matter in the far reaches of space or freshmen new to an expanded universe of

learning. The shared goals of investigation and discovery should bind together

the disparate elements to create a sense of wholeness.

Searching for a Shared Mission

The ecology of the university depends on a deep and abiding understanding that

inquiry, investigation, and discovery are the heart of the enterprise, whether

in funded research projects or in undergraduate classrooms or graduate

apprenticeships. Everyone at a university should be a discoverer, a learner.

That shared mission binds together all that happens on a campus. The teaching

responsibility of the university is to make all its students participants in the

mission. Those students must undergird their engagement in research with the

strong “general” education that creates a unity with their peers, their

professors, and the rest of society.

 Unfortunately, research universities are often archipelagos of

intellectual pursuit rather than connected and integrated communities.

Fragmentation has increased drastically during the last fifty years. At many

universities, research faculty and undergraduate students do not expect to

interact with each other, and both groups distinguish between teachers and

researchers as though the two experiences were not inextricably linked. Even

those students who encounter an introduction to research technique in one narrow

field too often remain ignorant of how diverse fields overlap and intermingle.

 The institutional goal of research universities should be a balanced

system in which each scholar—faculty member or student—learns in a campus

environment that nurtures exploration and creativity on the part of every

member.

A Beautiful and Efficient Concept

Ideally, the campus environment is enriched by interaction among faculty members

in disparate fields, with graduate students enlivened by their exploration of

faculty roles, and with undergraduates, whose questions and fresh approaches may

open new paths of inquiry. The faculty member, unlike the full-time non-academic

researcher, has interactions with other faculty and with students that broaden

his or her intellectual vista and simultaneously provide the opportunity to

develop future generations of professors and researchers. The baccalaureate

student shares in the environment and develops his or her own research

capabilities. The university setting for research is, therefore, much more

valuable to our society than the environment in corporate or non-profit research

laboratories and institutes. As Charles M. Vest, President of the Massachusetts

Institute of Technology, has pointed out, government funding of research in the

universities is also an investment in the education of the next generation, with

every dollar doing double duty, “a beautiful and efficient concept.” What is

more, the university’s investment in research faculty also does double duty,

with teaching ideally enhanced by the research experience of both faculty and

students.

Teaching Teachers to Teach

In contrast to this ideal, there is now a distressing and, in the long run, a

destructive lack of connection between undergraduate study and the creation of

future research faculty. The use of graduate students, particularly in certain

fields, has been treated as a necessity for the operation of both research

programs and undergraduate instruction. This perceived need has often led to the

importation of foreign students new to American education. The international

graduate students have been and must be welcomed in our universities; they have

added incalculable strengths to research programs and, after graduation, to

university faculties and research institutes. But the classroom results of

employing teaching assistants who speak English poorly, as a second language,

and who are new to the American system of education constitute one of the

conspicuous problems of undergraduate education. Unless fully proficient

speakers of English are attracted to the professoriate in the United States,

these problems will continue to exist. Research universities have, therefore, a

strong interest in introducing research-based education to undergraduates who

are proficient in English in the hope that many of those research-trained

undergraduates will be drawn toward academic careers. Joined by the bright and

eager international students, they will furnish unprecedented pools of talent

from which future faculties will be drawn.

Needed Now: a Synergistic System

Undergraduates who enter research universities should understand the unique

quality of the institutions and the concomitant opportunities to enter a world

of discovery in which they are active participants, not passive receivers.

Although shared knowledge is an important component of a university education,

no simple formula of courses can serve all students in our time. Collaborative

learning experiences provide alternative means to share in the learning

experiences, as do the multitudinous resources available through the computer.

The skills of analysis, evaluation, and synthesis will become the hallmarks of a

good education, just as absorption of a body of knowledge once was.

 The phrase “student-centered research university” has sprung into the

language of several research universities recently. At first glance it seems an

oxymoron, and certainly it does not clearly describe the relationship between

students and research—can universities be both student-centered and research-

centered? The possibility exists that a “research university,” properly defined,

could embody what the phrase attempts, through a synergistic system in which

faculty and students are learners and researchers, whose interactions make for a

healthy and flourishing intellectual atmosphere.

AN ACADEMIC BILL OF RIGHTS

When a university accepts an undergraduate student for admission and the student

then enrolls, implicit commitments constitute an unwritten contract between

them. Each assumes obligations and responsibilities, and each receives benefits.

The student commits to a course of study intended to lead to a degree, agrees to

follow such rules of civil behavior as the university prescribes, accepts the

challenge of making an appropriate contribution to the community of scholars,

and pledges to cultivate her or his mind, abilities, and talents with a view to

becoming a productive and responsible citizen. The student at a research

university, in addition, must come with appropriate preparation for the

opportunities that will be provided, must commit to the strenuous burdens of

active participation in the educational process, and must be prepared to live in

a diverse and heterogeneous environment.

 By admitting a student, any college or university commits itself to

provide maximal opportunities for intellectual and creative development. These

should include:

1. Opportunities to learn through inquiry rather than simple transmission of

knowledge.

2. Training in the skills necessary for oral and written communication at a

level that will serve the student both within the

university and in postgraduate professional and personal life.

3. Appreciation of arts, humanities, sciences, and social sciences, and the

opportunity to experience them at any intensity and depth the student can

accommodate.

4. Careful and comprehensive preparation for whatever may lie beyond

graduation, whether it be graduate school, professional school, or first

professional position.

The student in a research university, however, has these

additional rights:

1. Expectation of and opportunity for work with talented senior researchers

to help and guide the student’s efforts.

2. Access to first-class facilities in which to pursue research—laboratories,

libraries, studios, computer systems, and concert halls.

3. Many options among fields of study and directions to move within those

fields, including areas and choices not found in other kinds of institutions.

4. Opportunities to interact with people of backgrounds,

cultures, and experiences different from the student’s own and with pursuers of

knowledge at every level of accomplishment, from freshmen students to senior

research faculty.

 The research university must facilitate inquiry in such contexts as the

library, the laboratory, the computer, and the studio, with the expectation that

senior learners, that is, professors, will be students’ companions and guides.

The research university owes every student an integrated educational experience

in which the totality is deeper and more comprehensive than can be measured by

earned credits.

 The research university’s ability to create such an integrated education

will produce a particular kind of individual, one equipped with a spirit of

inquiry and a zest for problem solving; one possessed of the skill in

communication that is the hallmark of clear thinking as well as mastery of

language; one informed by a rich and diverse experience. It is that kind of

individual that will provide the scientific, technological, academic, political,

and creative leadership for the next century.

TEN WAYS TO CHANGE

UNDERGRADUATE EDUCATION

This concept of integrated education requires restructuring both the pedagogical

and the integrative aspects of the research university experience. The Boyer

Commission recommends the goals that follow in order to meet the obligations of

the university to all students, as expressed in the Academic Bill of Rights.

 One caveat: we believe that research universities must be willing and able

to break free from the traditions that have thus far governed budget creation

and budget approval in order to think creatively about goals and techniques for

reaching those goals.

Redirecting Resources

University budgets are now based on the principle of departmental hegemony; as a

result, important innovations such as new approaches through interdisciplinarity

are often doomed for lack of departmental sponsorship. Departments necessarily

think in terms of protecting and advancing their own interests, defined in terms

of numbers of faculty, courses, and majors. Initiatives for change coming from

sources outside departments are viewed as threats rather than opportunities. New

decisions on distributing resources must be carried out at the highest levels in

the university, and they can be expected to meet little enthusiasm from those

whose interests are protected by existing systems.

 Academics have long believed that research universities require large

lecture sections combined with study sections run by teaching assistants in

order to teach many lower division courses. Yet technology will unquestionably

change the nature of pedagogy. We believe that faculty time is best invested in

classes in which interaction with students is normal and integral. Used

creatively, electronic communication techniques can also be uniquely effective

for certain kinds of courses, for example, some of those that have been taught

in large lecture sections. Students are able to fit course materials into their

own schedules and repeat material as often as desired. Technology provides an

alternative context for learning, a context universities need to use. It is also

increasingly providing a channel of asynchronous communication between faculty

members and students. In the judgment of this Commission, research universities

have a special responsibility to develop educational technology that offers

students unique opportunities for learning. At the same time, technology cannot

be a substitute for direct interactions between human minds.

 Definitions of teaching load usually revolve around either how many hours

a professor spends in the classroom or the total number of students being

taught. However, if guided research becomes an important component of

undergraduate education, the professor may well conduct research and class

simultaneously but in a very different format. The old definitions of workload

will have to be replaced. Time-worn assumptions and practices cannot be allowed

to prevent needed change in undergraduate education.

 Conventional economic assumptions have governed administrative as well as

instructional costs. Universities usually behave as though administrative costs

are capable of change in only one direction. It is in the nature of bureaucratic

structures to grow, and unrestrained growth again and again absorbs resources

that could support academic creativity. Growth in size does not necessarily mean

increased usefulness. Universities must be willing to reexamine and re-evaluate

every administrative function and pare away everything that cannot demonstrate

its value. There must be a willingness to see how functions can be streamlined,

combined, or eliminated in order to provide some of the resources that new

educational initiatives demand.

 We believe universities must recognize the urgency of addressing

misdirections and inadequacies in the undergraduate experience, sharpen their

own plans and timelines, and move quickly beyond the realm of interesting

experiments and innovations to that of the institutionalization of genuine

reform. The following recommendations include both general statements on issues

of particular importance and specific suggestions for achieving the improvements

recommended. Together they envision a major overhaul of baccalaureate education

and consequently significant shifts in the balance of relationships of research,

graduate, and undergraduate education.

I. Make Research-Based Learning the Standard

Undergraduate education in research universities requires renewed emphasis on a

point strongly made by John Dewey almost a century ago: learning is based on

discovery guided by mentoring rather than on the transmission of information.

Inherent in inquiry-based learning is an element of reciprocity: faculty can

learn from students as students are learning from faculty.

 Important ideas rarely come fully-developed from the brain of a single

individual; all scholars work from the grounding provided by predecessors, and

few are not stimulated by the observations and criticisms of their peers. It is

one of the functions of a university to provide the context in which ideas can

be most productively developed. Bruce Alberts, President of the National Academy

of Sciences and a member of the Boyer Commission, has referred to the

“accidental collisions of ideas” necessary for the continued productivity of

faculty, and has suggested that the presence of students provides a

“lubrication” that breaks down intellectual barriers between faculty members.

When students at every level—baccalaureate, masters’, and doctoral—join with

faculty in common inquiry, the opportunities for “accidental collisions of

ideas” are optimized.

 When asked why universities expect that teachers both conduct research and

teach well, scholar-teachers are fond of replying that their teaching flows from

what they have learned through research, and many also say that their research

is affected by their teaching. Wayne C. Booth, Dean Emeritus at the University

of Chicago and member of the Commission, expressed what many others have felt:

 My books would have been quite different—and to me less valuable—if I had

produced them in solitude or after talking only with professional colleagues. It

was not just that thinking about how to teach students to read responsibly led

me to ideas that I would otherwise have overlooked. Responding to students’

rival readings actually changed my opinions about how to appreciate a given

novel or work of criticism. For this and other reasons, teaching and publishing

have always felt absolutely inseparable.

 The non-researcher is too often limited to transmitting knowledge

generated by others, but the scholar-teacher moves from a base of original

inquiry. In a research university, students should be taught by those who

discover, create, and apply, as well as transmit, insights about subjects in

which the teacher is expert.

 In reality, however, the undergraduate in our time may have little or no

direct contact with established scholar-teachers. Instruction very often comes

through the scholar’s apprentice, the graduate student; the academic luminary

featured in admissions bulletins appears rarely if at all in undergraduate

classes, and then too often as the lecturer addressing hundreds of students at

once. The context is intimidating for many, and they turn away in

discouragement. Recognizing that discouragement, some research universities have

responded by instituting smaller classes (though usually only for majors)

conducted by senior faculty, or undergraduate seminars in which senior students

are challenged to produce their own research.

 The inquiry-based learning urged in this report requires a profound change

in the way undergraduate teaching is structured. The traditional lecturing and

note-taking, certified by periodic examinations, was created for a time when

books were scarce and costly; lecturing to large audiences of students was an

efficient means of creating several compendia of learning where only one existed

before. The delivery system persisted into the present largely because it was

familiar, easy, and required no imagination. But education by inquiry demands

collaborative effort; traditional lecturing should not be the dominant mode of

instruction in a research university.

 The experience of most undergraduates at most research universities is

that of receiving what is served out to them. In one course after another they

listen, transcribe, absorb, and repeat, essentially as undergraduates have done

for centuries. The ideal embodied in this report would turn the prevailing

undergraduate culture of receivers into a culture of inquirers, a culture in

which faculty, graduate students, and undergraduates share an adventure of

discovery.

Involving Undergraduates in the Research Process

Because of the unique character of a research university, the process of

discovery is essentially a public one; the results of research are, through both

teaching and publication, offered publicly for critique, correction, and

extension. Undergraduates need to become an active part of the audience for

research. In a setting in which inquiry is prized, every course in an

undergraduate curriculum should provide an opportunity for a student to succeed

through discovery-based methods.

 The basic idea of learning as inquiry is the same as the idea of research;

even though advanced research occurs at advanced levels, undergraduates

beginning in the freshman year can learn through research. In the sciences and

social sciences, undergraduates can become junior members of the research teams

that now engage professors and graduate students. In the humanities,

undergraduates should have the opportunity to work in primary materials, perhaps

linked to their professors’ research projects. As undergraduates advance through

a program, their learning experiences should become closer and closer to the

activity of the graduate student. By the senior year, the able undergraduate

should be ready for research of the same character and approximately the same

complexity as the first-year graduate student; the research university needs to

make that zone of transition from senior to graduate student easy to enter and

easy to cross. For those who do not enter graduate school, the abilities to

identify, analyze, and resolve problems will prove invaluable in professional

life and in citizenship.

A Mentor for Every Student

Generations of experienced scholars have known and acted upon the knowledge that

the intellectual development of their graduate students is most effectively

guided in one-to-one relationships. Essentially the same techniques of tutorship

have been practiced at the undergraduate level in areas like art and music,

where individual performance is watched, corrected, assisted, and encouraged. In

the process, an undergraduate student and instructor can develop a supportive

relationship not unlike that found between doctoral candidate and advisor. This

kind of mentoring needs to be emulated throughout universities.

 In every discipline, field work and internships should be fostered to

provide opportunities for original work. In professional schools, these

experiences can occur on campus or externally through linkages with businesses,

hospitals, associations, governmental agencies, etc. Professional schools

operate primarily at the graduate level. Some, especially law schools, place an

emphasis on breadth of background, and some medical schools follow the same kind

of practice. But emphasis on breadth is seldom found in graduate schools of

business and engineering. Graduate professional schools need to re-cast their

admissions procedures to recognize the importance of the kinds of abilities that

will be produced by integrated inquiry-based learning. When they do so, they

will find their students more adaptive, more resourceful, and better able to

accommodate the challenges of specialized training and professional life, as

well as the relation of such training to social responsibilities. Those

professional schools that train undergraduate students need to accept the same

goals that obtain in the arts and sciences. Undergraduate engineers and business

majors, as much as their colleagues in literature and political science, will

benefit from the educational model being proposed. Particularly in the first

years of university life, students in the professional schools should share the

common experience.

 In the model the Commission proposes, scholar-teachers would treat the

sites of their research as seminar rooms in which not only graduate students but

undergraduates observe and participate in the process of both discovery and

communication of knowledge. Those with knowledge and skills, regardless of their

academic level, would practice those skills in the research enterprise and help

to develop the proficiency of others. Even though few researchers ever escape

the human temptation to compete for rewards, this model is collaborative, not

competitive. It assumes that everybody—undergraduate, graduate student, and

faculty member alike—is both a teacher and a researcher, that the educational-

research process is one of discovery, not transmission, and that communication

is an integral part of the shared enterprise.

Internships

Internships can offer an invaluable adjunct to research-based learning by

allowing the student concrete contexts in which to apply research principles.

Whether a student has an internship in a physics lab, a news room, a hospital,

or a business office, the experience can provide learning that cannot be

replicated in the classroom. For undergraduates in the arts and sciences as well

as in professional schools, these experiences provide useful, often

interdisciplinary, learning and real-life problem solving. When students need to

work to support their education, internships can make that economic requirement

a valuable part of university experience.

Specific recommendations to implement this model include:

1. Beginning in the freshman year, students should be able to engage in

research in as many courses as possible.

2. Beginning with the freshman year, students must learn how to convey the

results of their work effectively both orally and in writing.

3. Undergraduates must explore diverse fields to complement and contrast with

their major fields; the freshman and sophomore years need to open intellectual

avenues that will stimulate original thought and independent effort, and reveal

the relationships among sciences, social sciences, and humanities.

4. Inquiry-based courses should allow for joint projects and collaborative

efforts.

5. Professional schools need to provide the same inquiry-based opportunities,

particularly in the early years.

6. Provision of carefully constructed internships can turn inquiry-based

learning into practical experience; internship opportunities need to be widely

available.

II. Construct an Inquiry-based Freshman Year

The first year of a university experience needs to provide new stimulation for

intellectual growth and a firm grounding in inquiry-based learning and

communication of information and ideas.

 The freshman year is crucially important. It marks a transition in the

lives of young people both socially and academically. Many of them will spend a

long period away from home for the first time and be required to make new

friends and organize their lives without the close attention of families. Those

who continue to live at home will have different schedules, different

expectations, and different relationships. Freshmen who come directly from high

school leave a structured academic program for an environment in which they bear

far more personal responsibility for the nature of their learning.

 The freshman year needs to perform two vital functions: it must be the

bridge between high school and home on the one side and the more open and more

independent world of the research university on the other, and it must excite

the student by the wealth, diversity, scale, and scope of what lies ahead. If it

does not perform both those functions successfully, the entire university

experience is at risk.

 Ironically, the first years of university studies, in many ways the most

formative of all years, are usually the least satisfactory in terms of concept,

curriculum, and pedagogy. Many universities find, to their great distress, that

too many students spend time in the first year in remediation programs.

Introductory courses often repeat subject matter that freshmen have studied for

years rather than introducing new subjects that broaden their horizons and give

them a sense of the adventure of learning. Too often the freshman curriculum is

a bore and freshman instruction inadequate. Senior professors, when they teach

undergraduates, tend to teach majors in advanced courses, although these

students are usually the best equipped of all students for learning on their own

in the subject of their chosen major. As a result, freshmen—the students who

need the very best teaching—may actually receive the worst, and more of them

fall away by the end of the freshman year than at any other time.

 The first-year experience at most research universities was in the past

governed by the perceived need to give every student a common base of knowledge.

The “general education” requirements are now near extinction at many research

universities; what has survived is often more influenced by internal university

politics than educational philosophies. The freshman experience needs to be an

intellectually integrated one, so that the student will not learn to think of

the academic program as a set of disparate and unconnected requirements.

 Every institution needs to rethink both what every future citizen,

regardless of specialty or interests, needs to know in order to receive a degree

and at what point that knowledge is best aquired. Radical change is thus

essential to make the freshman year successful, a period of perhaps the fastest

growth a student experiences during the college years.

Seminar Learning

The freshman year should be reconfigured for maximum benefit, and the sophomore

year should evolve as a result of those changes. The focal point of the first

year should be a small seminar taught by experienced faculty. The seminar should

deal with topics that will stimulate and open intellectual horizons and allow

opportunities for learning by inquiry in a collaborative environment. Working in

small groups will give students not only direct intellectual contact with

faculty and with one another but also give those new to their situations

opportunities to find friends and to learn how to be students. Most of all, it

should enable a professor to imbue new students with a sense of the excitement

of discovery and the opportunities for intellectual growth inherent in the

university experience.

Block Scheduling

A supportive atmosphere for adjustment to university life can be created by

block scheduling cohorts of freshmen into two or three courses during their

first semester or year. Groups can also be joined according to mutual curricular

interests in living-learning centers or interest-focused residences.

Remediation Before Admission

The current national attention being given to the idea of fixed graduation

standards for public schools recognizes the deficiencies that too many students

now bring to college. Entering students should be required to have satisfactory

mathematics and oral and written language skills before taking any credit

courses. Remediation should not be a function of a research university; for a

research university to devote a large portion of its faculty time and its

facilities to prepare students for university study represents a dissipation of

increasingly scarce resources. Students should acquire the skills they need

before entering credit-bearing courses. Intensive summer programs in mathematics

and English may in many circumstances provide the necessary skills; students

with serious deficits should attend other kinds of institutions prepared to

handle their educational needs before enrolling in research universities.

International students who need greater experience in spoken or written English

should take intensive courses in English as a Second Language, in summers or

first semesters, before entering the normal curriculum.

Recommendations:

1. A student embarking upon a degree program at a research university should

be adequately prepared to meet the intellectual challenges of that program; if

remediation is necessary, it should be completed before entering the program.

2. All first-year students should have a freshman seminar, limited in size,

taught by experienced faculty, and requiring extensive writing, as a normal part

of their experience.

3. Every freshman experience needs to include opportunities for learning

through collaborative efforts, such as joint projects and mutual critiques of

oral and written work.

4. The freshman program should be carefully constructed as an integrated,

interdisciplinary, inquiry-based experience by designs such as:

 a. Combining a group of students with a combination of faculty and

graduate assistants for a semester or a year of study of a single complicated

subject or problem.

 b. Block scheduling students into two or three first-semester courses

and integrating those courses so that the professors plan together and offer

assignments together.

 c. If possible, integrating those courses with the freshman seminar, so

that there is a wholeness as well as a freshness to the first year.

 d. Taking advantage of time freed by advanced placement to explore

areas not studied in high school in order to encourage students to range as

freely as possible before selecting a major.

III. Build on the Freshman Foundation

The freshman experience must be consolidated by extending its principles into

the following years. Inquiry-based learning, collaborative experience, writing

and speaking expectations need to characterize the whole of a research

university education. Those students who enter the research university later

than the freshman year need to be integrated smoothly into this special

atmosphere.

 After the freshman student is initiated into the life of the research

university through a program that is innovative and exciting, the gains will be

lost if the rest of the university experience does not match. Moving from a

stimulating freshman seminar and an integrated program back into courses that

seem unrelated, with requirements that do not evoke the newly-awakened spirit of

research, would be dispiriting and disillusioning. So it is incumbent on the

university to carry the reforms to every part of the curriculum.

 This report does not address the issues of curricular change but rather

the questions of how subject matter is presented and how intellectual growth is

stimulated. The goal of making baccalaureate students participants in the

research process requires faculties to reexamine their methods of delivering

education, to ask how, in every course, students can become active rather than

passive learners. That task, undertaken seriously, will produce many innovations

suited to different disciplinary circumstances; the changes need to include

greater expectations of writing and speaking, more active problem-solving, and

more collaboration among baccalaureate students, graduate students, and faculty.

Long-term Mentorship

In a successful research experience, a relationship of trust and respect exists

among the members of a team; shared goals and community often follow.

Universities cannot expect that close personal relationships will or should

exist between every student and the faculty members to whom that student has

been exposed. But every student at a research university should be able to feel

that some faculty member knows and appreciates that student’s situation and

progress and is ready to help that progress by setting standards to be met and

by offering advice, encouragement, and criticism. To be effective, this kind of

mentoring relationship needs to be created early and maintained when possible

throughout a student’s program. Such a relationship should go beyond the routine

suggestions about choice of courses that many departments consider to be

“advising”; it requires patience and commitment from the faculty member, but the

relationships built can be mutually rewarding.

Integrating Transfer Students

Research universities, particularly the state-supported universities, very often

accept into their upper-class majors large numbers of students who have begun

their educations elsewhere, at community colleges, at liberal arts colleges, or

at other universities. In is not unusual for students to attend more than one

institution before settling. Their freshman experience is over, for better or

for worse, but they need to be integrated into the atmosphere of the research

university and given as much as possible of the kind of inquiry-based experience

that they missed. Special seminars or similar courses for transfer students

would make up a major part of the deficit.

Recommendations:

1. The inquiry-based learning, collaborative efforts, and expectations for

writing and speaking that are part of the freshman experience need to be carried

throughout the program.

2. Thoughtful and attentive advising and mentoring should

integrate major fields with supporting courses so that

programs become integrated wholes rather than collections of disparate courses.

3. Mentorships should begin as early as possible and should be maintained,

whenever possible, throughout a student’s academic career.

4. New transfer students need to be integrated into the research experience

with special seminars or similar courses comparable to the freshman seminar.

IV. Remove Barriers to Interdisciplinary Education

Research universities must remove barriers to and create mechanisms for much

more interdisciplinary undergraduate education.

 In the earlier decades of the century, research was characteristically

confined within traditional boundaries of disciplines that had themselves been

defined only a few generations earlier. The anthropologist and the historian

rarely ventured into each other’s realms; nor did the chemist and the physicist.

But in the years since World War II the continuing appearance of new departments

and new programs that merge fields has proven repeatedly the permeability of the

lines between disciplines. Individual researchers find that pushing the limits

of their field takes them into new territories and that the work they are doing

may have much more in common with that of colleagues across the campus than with

members of their own departments.

 The principal barrier to interdisciplinary research and study has been the

pattern of university organization that creates vested interests in

traditionally defined departments. Administratively, all educational activity

needs to “belong” somewhere in order to be accounted for and supported; that

which has no home cannot exist. Courses must be offered under some kind of

sponsorship; students are asked to place themselves in one discipline or

another. The limitations on this kind of structure are recognized in every

university by defining new departments, approving new programs, and creating new

centers in which to house courses, often experimental, that do not fit into the

disciplines. But those centers repeatedly must call on the departments to teach

the courses, knowing that the departments may balk at doing so since the

interdisciplinary programs deplete staffing for their own departmental courses.

Students who find that existing majors do not suit their interests often

encounter discouraging barriers; advisors will likely first try to fit those

interests into one of the existing patterns.

Breaking the Disciplinary Molds

As research is increasingly interdisciplinary, undergraduate education should

also be cast in interdisciplinary formats. Departmental confines and reward

structures have discouraged young faculty interested in interdisciplinary

teaching from engaging in it. But because all work will require mental

flexibility, students need to view their studies through many lenses. Many

students come to the university with some introduction to interdisciplinary

learning from high school and from use of computers. Once in college, they

should find it possible to create individual majors or minors without undue

difficulty. Understanding the close relationship between research and classroom

learning, universities must seriously focus on ways to create

interdisciplinarity in undergraduate learning.

Recommendations:

1. Lower division courses should introduce students to interdisciplinary

study.

2. Academic majors must reflect students’ needs rather than departmental

interests or convenience.

3. Customizing interdisciplinary majors should be not only possible but

readily achievable.

V. Link Communication Skills and Course Work

Undergraduate education must enable students to acquire strong communication

skills, and thereby create graduates who are proficient in both written and oral

communication.

 The failure of research universities seems most serious in conferring

degrees upon inarticulate students. Every university graduate should understand

that no idea is fully formed until it can be communicated, and that the

organization required for writing and speaking is part of the thought process

that enables one to understand material fully. Dissemination of results is an

essential and integral part of the research process, which means that training

in research cannot be considered complete without training in effective

communication. Skills of analysis, clear explanation of complicated materials,

brevity, and lucidity should be the hallmarks of communication in every course.

 At present, most writing in universities is addressed to professors who

know more about the subject matter than the writers, but all students should be

taught to write for audiences less informed on the topic than the writer. After

college there will be little need to write “up” to a professor; it will be more

important to write “down to an audience that needs information and/or opinions,

even if that audience happens to be the employer or higher authority. The

abilities to explain, to convey new information, and to condense materials for

easy absorption will be essential for any profession.

 Unfortunately, today’s students too often think of composition as a boring

English requirement rather than a life skill; moreover, hardly any are exposed

to courses or class requirements in oral communication. Faculty too often think

of composition as a task the English or composition department does badly,

rather than understanding that an essential component of all faculty members’

responsibility is making sure that their students have ample practice in both

writing and speaking. In evaluating examinations and papers, faculty members are

often willing to forgive grammatical and stylistic blunders, thinking such

matters the responsibility of composition teachers, as long as they believe they

can grasp the essence of the student’s text; that behavior reinforces the

assumption on the part of students that clear communication is not important.

Communication in Every Course

>From the freshman seminar to the senior capstone course, communication skills

should be integrated with the subject matter. Freshman composition must be cast

in a new form intimately related to a student’s other courses. Instructors

throughout the curriculum need to build opportunities for written and oral

presentations into their course outlines, so that experience and confidence can

grow continuously. Faculty members need to assign papers as part of normal

course expectations and to create examinations that require demonstration of

writing and analytical skills.

 Communications must be similarly emphasized in the education of graduate

students (see Section VIII below, Educate Graduate Students as Apprentice

Teachers).

Recommendations:

1. All student grades should reflect both mastery of content and ability to

convey content. Both expectations should be made clear to students.

2. The freshman composition course should relate to other classes taken

simultaneously and be given serious intellectual content, or it should be

abolished in favor of an integrated writing program in all courses. The course

should emphasize explanation, analysis, and persuasion, and should develop the

skills of brevity and clarity.

3. Writing courses need to emphasize writing “down” to an audience who needs

information, to prepare students directly for professional work.

4. Courses throughout the curriculum should reinforce communication skills by

routinely asking for written and oral exercises.

5. An emphasis on writing and speaking in graduate courses will prepare

teaching assistants for research, teaching, and professional roles.

VI. Use Information Technology Creatively

Because research universities create technological innovations, their students

should have the best opportunities to learn state-of-the-art practices—and learn

to ask questions that stretch the uses of the technology.

 Continuing technological development, particularly in the areas of

information storage, retrieval, and communication, can be expected to alter the

manner of teaching at every educational level and in every conceivable setting.

We know that emerging technology is ceaselessly changing and will continue to

change the ways in which the world functions and the ways in which people live.

What we haven’t been able to predict is exactly how. In the words of Milton

Glaser, designer and Boyer Commission member, “technology is never neutral .” It

is the role of universities to make technology positive.

 No institutions are better suited to make a difference in our

technological future than research universities. Much of what we think of as

sophisticated technology was created in their halls, and there is every reason

to believe that university scholars will lead the way to continuing

improvements. Scientific benefits aside, research universities are particularly

well suited to take advantage of technology for teaching undergraduates.

The Electronic Classroom

Research universities, because of their size and academic mission, are far more

likely than other institutions to possess the technological capabilities for

twenty-first century teaching in any area. At many universities, computer

networks, wired classrooms, and laser discs are used to bring recent research

findings and methods directly into the classroom. Creative applications of

technology abound. A few examples:

• At the University of California, Berkeley, a state-of-the-art center

for video conferencing and intercampus instruction allows courses—some of

them as esoteric as Armenian History or Medieval Catalan—to be offered in

collaboration not only with other University of California campuses but

with other universities both in the United States and abroad; they allow

any student anywhere to interact with faculty and classmates in real time.

• A freshman non-major science course at the University of Texas uses

multimedia software modules with 3-D visuals,

animation, and sound in addition to text which has links to remedial and

supplementary materials.

• Massachusetts Institute of Technology has developed a large-scale

computer service agency that, among other functions, provides an on-line

teaching assistants’ program to answer student queries, distributes

lectures through a cable-television network, and provides genetics-

modeling software for biology courses.

 It has become routine in universities for assignments to be sent and

received and students’ questions answered through electronic mail. If faculty

give appropriate attention to teaching innovations, universities can become the

technological pacesetters in teaching that they have always been in research;

commercial developers await the products now. However, as innovations multiply,

so do dangers: in many circumstances, casual over-use of technological aids

already increases the real and psychological distance between living faculty

members and living students. Technological devices cannot substitute for direct

contact.

Enriching Teaching Through Technology

It is incumbent upon the faculties of research universities to think carefully

and systematically not only about how to make the most effective use of existing

technologies but also how to create new ones that will enhance their own

teaching and that of their colleagues. The best teachers and researchers should

be thinking about how to design courses in which technology enriches teaching

rather than substitutes for it. And equally important, faculties need to concern

themselves with the need to give their students the tools with which they can

explore deeply as well as widely, with which they can discriminate, analyze, and

create rather than simply accumulate.

 If anything is evident, it is that the more information a person can

obtain, the greater the need for judgment about how to use it. Obtaining

information from the Internet is easy; children in elementary school can do it.

But who teaches students how to take advantage of this mass of information? Who

teaches them how to tell the difference between valuable information and

clutter? How, in short, does a student become a more intelligent consumer in

this supermarket of information? The answer, we believe, is by exposure to

scholars--experienced, focused guides who have spent their lives gathering and

sorting information to advance knowledge.

Recommendations:

1. Faculty should be alert to the need to help students discover how to frame

meaningful questions thoughtfully rather than merely seeking answers because

computers can provide them. The thought processes to identify problems should be

emphasized from the first year, along with the readiness to use technology to

fullest advantage.

2. Students should be challenged to evaluate the presentation of materials

through technology even as they develop an increasing familiarity with

technological possibilities.

3. Faculties should be challenged to continue to create new and innovative

teaching processes and materials, and they should be rewarded for significant

contributions to the technological enrichment of their courses.

4. Planning for academic units, such as block-scheduled courses for freshmen

or required courses for individual majors, should include conscientious

preparations for exercises that expand computer skills.

5. Active interchange between units on campus and through professional

meetings should encourage and inspire faculty to create new computer

capabilities for teaching and to share ideas about effective computer-based

learning.

VII. Culminate With a Capstone Experience

The final semester(s) should focus on a major project and utilize to the fullest

the research and communication skills learned in the previous semesters.

 In order to ensure that the educational experience is drawn together, the

student needs a course at the end of the curriculum that corresponds to the

capstone of a building or the keystone of an arch. Too many students report a

sense of anti-climax in their senior years—just add more to the total of

courses, and it is finished! All the skills of research developed in earlier

work should be marshaled in a project that demands the framing of a significant

question or set of questions, the research or creative exploration to find

answers, and the communication skills to convey the results to audiences both

expert and uninitiated in the subject matter. When earlier course experience is

inquiry-based, the student will be ready for and stimulated by the demands of

this course. The nature of the experience will vary widely according to the

major discipline of the student, but it should be of value equally to the

budding social scientist, bench scientist, artist, humanist, engineer, or

business major. The capstone experience needs to allow for collaborative effort

whenever appropriate to the discipline, so that undergraduate students can be

better prepared for participation in the team projects they will encounter in

professional as well as private life.

The Culmination of Academic Effort

The experience should enable the student to bring to a symbolic conclusion the

acquisition of knowledge and skills that has preceded this final effort. It

should be conducted under the mentorship of a seasoned scholar-teacher who

understands the joys and frustrations of a major project. It should allow the

student to understand her or his potential for serious work and develop the

aspiration to do it well. Ideally, the mentor for the capstone course may be the

student’s major advisor or a faculty member already familiar with his or her

capabilities and experience.

 Although each university will find unique embodiments of the capstone

concept, ideally the experience will occur within a small community of learners

comprising senior researchers, graduate students, and undergraduate peers. This

course should be the bridge to graduate education for the holders of research

university baccalaureate degrees who immediately enter graduate school. For

graduates entering the work force, the course should provide experience in the

analysis, team-building, and problem-solving that most professional situations

demand.

 We hope that many students will conduct these research or creative

projects in interdisciplinary groups, choosing topics and using techniques that

break through disciplinary barriers. The flexibility that should mark the

graduate of a research university should be fully developed in this final,

culminating experience.

Recommendations:

1. Senior seminars or other capstone courses appropriate to the discipline

need to be part of every undergraduate program. Ideally the capstone course

should bring together faculty member, graduate students, and senior

undergraduates in shared or mutually reinforcing projects.

2. The capstone course should prepare undergraduates for the expectations and

standards of graduate work and the professional workplace.

3. The course should be the culmination of the inquiry-based learning of

earlier course work, broadening, deepening, and integrating the total experience

of the major.

4. The major project may well develop from a previous research experience or

internship.

5. Whenever possible, capstone courses need to allow for collaborative

efforts among the baccalaureate students.

VIII. Educate Graduate Students as Apprentice Teachers

Research universities must redesign graduate education to prepare students for

teaching undergraduate students as well as for other professional roles.

 Although graduate education is not at the center of our concern, clearly

the metamorphosis of undergraduate education at research universities can not

occur without suitable adjustments in the way that graduate students are

prepared for their professional roles. Over the last several decades,

universities have prolonged doctoral study, but they have not necessarily

improved it by doing so. A graduate degree is a professional degree, intended

both to furnish credentials and to prepare students for their life’s work. But

important aspects of their life’s work have been neglected or ignored in their

doctoral programs, to their detriment and that of the undergraduates they are

expected to teach.

 More than half of all doctoral students will seek employment in colleges

and universities, 54 per cent according to the National Research Council’s 1995

Survey of Earned Doctorates. The percentage of Ph.D.’s who become faculty varies

broadly between fields, ranging from 83 per cent of humanities majors to 22 per

cent of engineering majors. Most future faculty, however, cannot realistically

expect to find positions at the 3 per cent of the nation’s colleges and

universities that are research universities. Yet graduate education severely

neglects the professional goal of the majority of students who will become

college professors, that is to say, teaching.

Reshaping Professional Training

Many students go directly from their bachelor’s degrees into graduate school.

Suddenly they are expected to be experts in their fields; we forget that last

year they were mere seniors. They have great needs to acclimate themselves to a

very different kind of learning experience. Simultaneously, we burden them with

the responsibilities of research or teaching assistantships. Although more

affluent institutions may allow them a grace period before beginning their

assistantships, too many plunge them directly into their duties. This situation

can be most harmful when they begin teaching immediately, sometimes in fields

that may well not be their specialty (for example, literature majors teaching

composition or foreign language courses). Moreover, they are too often expected

to know how to teach with little more than a few days or weeks of casual

training and with little or no supervision throughout the year.

 When these neophytes enter the classroom, they rarely come armed with

serious training in pedagogy. Perhaps they will have a provided syllabus in a

multi-sectional course; perhaps they will be placed in charge of sections of

freshman mathematics or composition. Too often they will sense that spending

time on teaching will hurt them by taking away from their concentration on their

own study and research. The situation creates the greatest possibility for poor

teaching at the time that the freshman needs the best teaching and mentoring. It

also creates great stress at the time the new graduate student is most

vulnerable, sometimes leading to early burnout and often to poor teaching.

 There is a striking discrepancy now between the nature of graduate work

and the nature of the professional careers for which graduate students are being

prepared. In particular, people educated to the doctoral level are expected by

their employers and by society to be highly proficient in their fields, to be

able to evaluate the work of others, to be producers of knowledge that will

enrich or improve life, and to be effective communicators to whatever audiences

are appropriate. Corporate leaders who recruit new Ph.D.’s seek employees who

are accomplished at teamwork, at critical thinking, problem-solving, and oral

and written communication. Yet graduate education too often ignores all those

expectations. Graduate students are given intensive work in narrowly defined

subjects and meticulous training in the technical skills required for research

projects; it is the unstated assumption that the other expectations will be met

without organized effort--met, presumably, by the general education that

preceded graduate training. For too many people, that assumption is unwarranted.

Restoring Communication

Nowhere are the failures of graduate education more serious than in the skills

of communication. Corporate leaders complain that new Ph.D.’s too often fail as

communicators and cannot advance their own careers or contribute to the success

of their companies. Again and again, effective communication proves to be at

least as important as specific knowledge content or technological training.

 The importance of communications skills for academic careers is, of

course, self-evident, for professors must teach, lecture to colleagues, and

publish their research. Yet the skills of writing and speaking are by and large

ignored in graduate education, certainly not taught as essential skills required

for graduation. Obviously, the lack of emphasis on these skills, even when

graduate students become teaching assistants, has a profound effect on

undergraduate education.

 No student lacking in basic English skills should be expected or required

to enter a classroom to teach. The issues here are far bigger than those of

accent and grammar; the teacher in any course must also be a teacher of writing

and speaking skills. Any graduate student, therefore, who does not possess these

skills must acquire them in order both to graduate and to teach.

Solving the Teaching Crisis

Given the fact that so many doctoral students are preparing for academic

careers, the reconstitution of doctoral programs will have a profound effect on

undergraduate education. If undergraduate programs truly produce good

communications skills, then the alumni of those programs will begin their

graduate study well prepared, thus reducing the crisis in writing and speaking

abilities that exists now in courses taught by some teaching assistants.

 Ideally, teaching assistants will also use their classroom opportunities

to foster the ability to frame questions, to seek answers independently, and to

think in interdisciplinary ways. As those abilities are essential to doctoral

study, so they should be initiated and encouraged in undergraduates from their

earliest courses, i.e. those often taught by teaching assistants.

 Some universities are giving greater emphasis to teaching techniques as

part of graduate student education, but few have explored mentoring

relationships or the synergy of these interactions (i.e., how do undergraduates

teach graduates, and how do graduates stimulate the intellectual growth of

faculty members?).

 Teaching is a difficult enough task in any setting, and in a research

university the difficulties are magnified. The faculties of research

universities must demonstrate to their graduate students how to lead

undergraduates on their journeys of inquiry and discovery, and graduate students

must master those teaching skills if they are to succeed as faculty members.

Overdue as those ideas may be, undergraduates can expect to benefit when they

are fully put in practice.

Recommendations:

1. All graduate students should have time to adapt to graduate school before

entering classrooms as teachers.

2. Graduate apprentice teachers should be assisted by one or more of the

following means: seminars in teaching, thoughtful supervision from the professor

assigned to the course, mentoring by experienced teachers, and regular

discussions of classroom problems with other new teachers.

3. Graduate students should be made aware of their classroom roles in

promoting learning by inquiry. They should not

be limited to knowing the old modes of transmission of knowledge without

understanding the role of student and faculty as joint investigators.

4. Graduate courses need particular emphasis on writing and speaking to aid

teaching assistants in their preparation for teaching as well as research

functions.

5. Graduate students should be encouraged to use technology in creative ways,

as they will need to do in their own careers.

6. Compensation for all teaching assistants should reflect more adequately

the time and effort expected.

7. Graduate students should be encouraged through special rewards for

outstanding teaching. Financial awards should be established for outstanding

teaching assistants. The permanent faculty should make it clear through these

awards and through all they do that good teaching is a primary goal of graduate

education.

IX. Change Faculty Reward Systems

Research universities must commit themselves to the highest standards in

teaching as well as research and create faculty reward structures that validate

that commitment.

 In 1895, the first president of the University of Chicago, William Rainey

Harper, asked each new faculty member to agree in writing that advancements in

rank and salary would be governed chiefly by research productivity. His

stipulation, novel in its time, would raise few eyebrows in most research

universities a century later. They might claim otherwise, but research

universities consider “success” and “research productivity” to be virtually

synonymous terms.

 The typical department in a research university will assert that it does

place a high value on effective teaching at the baccalaureate level. It will be

able to cite faculty members among its ranks who take conspicuous pride in their

reputations as successful teachers; it may be able to point to student

evaluations that give consistently high ratings to many of its members. At the

same time, however, discussions concerning tenure and promotion are likely to

focus almost entirely on research or creative productivity. The department head

when making salary recommendations may look almost exclusively at the grants or

publication record. The junior faculty member who seems to give disproportionate

time and attention to freshman/sophomore courses may well be counseled toward

more “productive” redirection; if interest is shown in experimental or

interdisciplinary courses at the baccalaureate level, movement toward tenure or

promotion may be stalled. The “needs of the department” will be perceived as not

being met.

 What happens within the department is echoed and reinforced among the

established disciplines on a national scale. The professional associations do

not as a rule see their responsibilities as embracing the teaching function,

even though it is inspired teaching that attracts young minds and pulls new

recruits into the disciplines. The national conferences of the disciplines

rarely offer sessions dealing with teaching effectiveness, and when they do so,

those sessions are likely to be poorly attended.

Synergy of Teaching and Research

The university’s essential and irreplaceable function has always been the

exploration of knowledge. This report insists that the exploration must go on

through what has been considered the “teaching” function as well as the

traditional “research” function. The reward structures in the modern research

university need to reflect the synergy of teaching and research—and the

essential reality of university life: that baccalaureate students are the

university’s economic life blood and are increasingly self-aware.

 The kind of collaborative exploration that is urged here cannot be carried

on in lecture sessions with hundreds of students. Budgetary constraints and the

nature of survey courses may mean that some such courses continue; still, the

teaching schedule of each faculty member needs to provide for small-group

situations for baccalaureate students and a context that places them in joint

exploration. Faculty course loads must also allow for research mentoring as part

of normal operations rather than as poorly-compensated overloads.

 Universities rightly assume that whoever appears in front of their

classrooms can command the material that should be conveyed. Rare individuals

can also captivate and stimulate student audiences, large and small, with their

dynamic classroom presentations. Since it is likely that most universities will

need to retain some large classes, those individuals capable of striking success

in the classroom should be suitably rewarded. Recognition as distinguished

teacher-scholars should include added remuneration.

Evaluating Teaching

In calculating academic rewards, it has been painfully difficult to evaluate the

quality of research as separated from its mass. Nevertheless, departments and

deans find that for passing judgment on peers, research productivity is a much

more manageable criterion than teaching effectiveness. Faculty gossip, student

evaluations, and alumni testimonials have all been notoriously weak reeds, and

reliable self-evaluation is all but impossible. The publication of Scholarship

Assessed, begun by Dr. Boyer before his death and published by the Carnegie

Foundation for the Advancement of Teaching, pursues the issues of evaluating

research. Recently the National Research Council has initiated a major study on

how to evaluate science and mathematics teaching. But at this point promotion

and tenure committees still find teaching effectiveness difficult to measure.

Publication is at least a perceptible tool; the relative ease of its use has

reinforced the reliance on it for tenure and promotion decisions. Evaluating

good teaching will always be difficult, but effective integration of research

and teaching should be observable, as should the development of

interdisciplinary approaches to learning. Departments and deans must be pressed

to give significant rewards for evidence of integrated teaching and research and

for the imagination and effort required by interdisciplinary courses and

programs. When publication is evaluated, attention should be paid to the

pedagogical quality of the work as well as to its contribution to scholarship.

 It has been emphasized here that a university is a community of learners.

Some of them are more experienced than others; some are far along the way toward

academic maturity, and some are not. Still, all are committed to the exploration

of defined areas of knowledge, and in the university as envisioned here, they

work together. Faculty members, graduate students, baccalaureate students all

bring their particular combinations of energy, imagination, experience, and

accumulated knowledge to bear. The divisions that have been created between them

are artificial and counter-productive and must be bridged for effective

collaborations to occur. All members of an academic team can share in the

efforts and the rewards.

Recommendations:

1. Departmental leaders should be faculty members with a demonstrated

commitment to undergraduate teaching and learning as well as to traditionally

defined research.

2. The correlation between good undergraduate teaching and good research must

be recognized in promotion and tenure decisions.

3. A “culture of teaching” within departments should be cultivated to

heighten the prestige of teaching and emphasize the linkages between teaching

and research.

4. Prestigious professional research meetings such as national disciplinary

conferences and the Gordon Conferences should contain one or more sessions that

focus on new ideas and course models for undergraduate education.

5. Sponsors of external research grants can and should promote undergraduate

participation, as the National Science Foundation has begun to do, thus

facilitating the research experiences of undergraduates.

6. Rewards for teaching excellence, for participation in interdisciplinary

programs, and for outstanding mentorship need to be in the form of permanent

salary increases rather than one-time awards.

7. Teachers capable of inspiring performance in large classes should be

recognized and rewarded appropriately.

8. Committee work at all levels of university life should be greatly reduced

to allow more time and effort for productive student-related efforts.

X. Cultivate a Sense of Community

Research universities should foster a community of learners. Large universities

must find ways to create a sense of place and to help students develop small

communities within the larger whole.

 Diversities of many kinds characterize research universities, which must

balance the needs of residential students and commuters, recent high school

graduates and returning professionals, native-born and international students.

There is more of everything—more students, more professors, more courses, more

books in the library, more computers, more laboratories, more student

activities. Clearly the complexity of these intellectual cities can give

students the opportunity to create their own customized communities within, but

that complexity can also be baffling and overwhelming to students, making them

feel lonely, remote, and too anxious for optimal learning.

 A sense of community is an essential element in providing students a

strong undergraduate education in a research university. Whereas graduate

students may readily gravitate to disciplinary colleagues around common research

interests, beginning undergraduates rarely arrive with common intellectual

connections.

 The importance of a sense of personal identity within both large and small

communities at the research university entered every discussion of the Boyer

Commission. The campus must be a purposeful place of learning in which every

student feels special connections. But that personal awareness of connections

cannot occur unless there is a responsiveness to place and community. Therefore

shared rituals play a powerful role in creating the larger university community

in which the smaller, personalized communities of learners can coalesce. Whether

the traditions are student convocations, pep rallies or football games, campus-

wide celebrations, candlelight ceremonies, or graduation exercises, university-

wide traditions feed the need for a connection with place, a unique campus

character. These rituals create the aura for a community of learners comprising

all members of the university linked by intellectual interests, community

values, and interpersonal relations.

Diversity as an Asset

Racial and ethnic diversity is a critical element in building community values,

although it is still usually perceived as a problem instead. The presence of

international students and nationals of many kinds of backgrounds gives research

universities a richness of texture unavailable in most American communities; the

challenge facing universities is to make that texture a positive element in the

lives of all students. Many extracurricular activities and clubs build on shared

interests, sometimes ethnic, religious, or cultural, but sometimes totally race-

and ethnicity-blind. Members of an orchestra, for example, care about and rely

upon each other’s musicianship, not on similarities of background; members of a

basketball or mathematics team, actors in a play, or journalists on the student

newspaper want the best performers as their colleagues, regardless of ethnicity.

Through experiences outside the classroom, students profit from different

approaches to the same issues.

 The same is true within the classroom. Students enhance the texture of

their learning by listening and interacting with faculty and students from

different ethnic and cultural backgrounds. Faculty and graduate students become

partners and guides for undergraduate study groups and project teams through

collaborative learning. When students work in collaborative projects, they can

benefit from the range of experiences and perspectives that different

backgrounds provide. Diversity of backgrounds and approaches enriches the

process of discovery, the ways of thinking about solving problems, the multiple

modes of communicating ideas. Therefore a comfort level with difference, as well

as flexibility to learn in various ways, must emanate from the institution.

Linking Commuters and Residents

Commuters and residential students alike need to know that they are needed and

valued members of the community. Most research universities include large

numbers of both commuter students and residents, yet club and community

activities tend to be geared for the convenience of the residents and

inconvenience of the commuters. Part of the experience of diversity involves the

commingling of these two groups, whose experience outside the classroom may be

very different. Commuters, who often stay on campus just long enough for their

classes, should be drawn into more interaction with residential students,

graduate students, and faculty, through collaborative learning situations, co-

curricular activities, and shared rituals and celebrations.

Recommendations:

1. Research universities need to cultivate a sense of place through

appropriate shared rituals that are attractive to the widest possible

constituencies within the student population.

2. The enriching experience of association with people of diverse

backgrounds, ethnicities, cultures, and beliefs must be a normal part of

university life.

3. Residence halls should nurture community spirit.

4. Commuting students must be integrated into university life by making their

participation easy and attractive.

5. Collaborative study groups and project teams should be used as a means of

creating customized communities for residential and commuting students.

6. Common interests, such as that in maintaining the beauty of the campus

setting or supporting charitable or service projects, should be cultivated by

creating teams that build community as they work toward a shared goal.

7. Major issues forums, multicultural arts programming, and other

extracurricular sharing of ideas, opinions, and arts bring students together,

particularly when groups or clubs sponsor or help sponsor the events.

8. Campus programming, such as lectures and performing arts programs, taken

as a whole, need to touch the interests of as many audiences as possible.

CONCLUSION

Research universities are so complex, so multifaceted, and often so fragmented

that, short of major crisis, they can rarely focus their attention on a single

agenda. We believe that the state of undergraduate education at research

universities is such a crisis, an issue of such magnitude and volatility that

universities must galvanize themselves to respond. Insofar as they have seen as

their primary responsibility the creation and refinement of knowledge, America’s

research universities have been superbly successful; in ways innumerable and

immeasurable they have been the wellsprings of national stature and achievement.

But in the education of undergraduates the record has been one of inadequacy,

even failure. In a context of increasing stress—declining governmental support,

increased costs, mounting outside criticism, and growing consumerism from

students and their families—universities too often continue to behave with

complacency, indifference, or forgetfulness toward that constituency whose

support is vital to the academic enterprise. Baccalaureate students are the

second-class citizens who are allowed to pay taxes but are barred from voting,

the guests at the banquet who pay their share of the tab but are given

leftovers.

 Captivated by the excitement and the rewards of the research mission,

research universities have not seriously attempted to think through what that

mission might mean for undergraduates. They have accepted without meaningful

debate a model of undergraduate education that is deemed successful at the

liberal arts colleges, but they have found it awkward to emulate. The liberal

arts model required a certain intimacy of scale to operate at its best, and the

research universities often find themselves swamped by numbers. The model

demands a commitment to the intellectual growth of individual students, both in

the classroom and out, a commitment that is hard to accommodate to the research

productivity that brings research universities recognition, professional

advancement, and financial security. Almost without realizing it, research

universities find themselves in the last half of the century operating large,

often hugely extended undergraduate programs as though they are sideshows to the

main event. The numbers are there but the attention is elsewhere. It is the

purpose of this report to try to bring the undergraduates into the big tent, to

explore what kind of education a research university might offer that would

fully fit its character and take advantage of its resources.

Commitment to Dramatic Change

For decades we have employed the rhetoric of change; for decades experiments

have been undertaken. Now those experiments are becoming more varied, sometimes

more successful, and often more serious. Some funding agencies have directed

money and attention to undergraduate issues. Still, considering the nation as a

whole, efforts have been timid, sporadic, limited, and unavailing. We believe

that universities must commit to significant transformation now. Research

universities must be willing to approach the issue of undergraduate education

free from the blinders of past practice, to ask basic questions and be prepared

for answers that require radical reformation of methods of operation. Given the

scale of the institutions and the multitude of interests touched, change will be

anything but easy. The commitment to dramatic change, not half measures, must be

made now, and action must respond to the urgency of the issue.

 We believe that the basic direction of change is clear: undergraduates

need to benefit from the unique opportunities and resources available in

research universities; clumsy adaptations of the practices of liberal arts

colleges will no longer serve. The research universities need to be able to give

to their students a dimension of experience and capability they cannot get in

any other setting, a research experience that is genuine and meaningful. They

should turn out graduates who are well on the way to being mature scholars,

articulate and adept in the techniques and methods of their chosen fields, ready

for the challenges of professional life or advanced graduate study. Research

universities have unique capabilities and resources; it is incumbent upon them

to equip their graduates to undertake uniquely productive roles.

 The recommendations in this report may not attract every institution, but

we hope that faculties will be motivated to debate the issues raised here and to

accelerate their pace of action. In the hope of speeding that process, we have

established a home page [http://www.sunysb.edu/boyerreport] where discussions

may continue.

 Research universities cannot continue to operate as though the world

around them is that of 1930 or 1950 or 1980. As everyone knows, it is changing

with dizzying rapidity. These universities must respond to the change; indeed,

they ought to lead it. Their students, properly educated for the new millenium,

will be required as leaders while that world continues to transform itself.

 In the Preface to his 1990 study, Scholarship Reconsidered, Ernest Boyer

wrote, “the most important obligation now confronting the nation’s colleges and

universities is to break out of the tired old teaching versus research debate

and define, in more creative ways, what it means to be a scholar.” This report

hopes to refine the context of that remark and to affirm that the most important

obligation now confronting research universities is to define in more creative

ways what it means to be a research university committed to teaching

undergraduates. The nation demands and deserves no less.

Appendix A

American Research Universities

Following are the institutions classified by the carnegie foundation for the

advancement of Teaching as research universities. The universities offer a full

range of baccalaureate programs (with two exceptions, as noted), are committed

to graduate education through the doctorate (50 or more degrees each year), and

give high priority to research, including a minimum of $15.5 million (Research

II) or $40 million (Research I) in annual federal support.

Arizona State University

Auburn University

Boston University

Brandeis University

Brigham Young University

Brown University

California Institute of Technology

Carnegie Mellon University

Case Western Reserve University

Clemson University

Colorado State University

Columbia University

Cornell University

Duke University

Emory University

Florida State University

Georgetown University

George Washington University

Georgia Institute of Technology

Harvard University

Howard University

Indiana University (Bloomington)

Iowa State University

Johns Hopkins University

Kansas State University

Kent State University

Lehigh University

Louisiana State University

Massachusetts Institute of Technology

Michigan State University

Mississippi State University

New Mexico State University

New York University

North Carolina State University

Northeastern University

Northwestern University

Ohio State University

Ohio University

Oklahoma State University

Oregon State University

Pennsylvania State University

Princeton University

Purdue University

Rensselaer Polytechnic Institute

Rice University

Rockefeller University\*

Rutgers University (New Brunswick)

St. Louis University

Southern Illinois University (Carbondale)

Stanford University

State University of New York (Albany)

State University of New York (Buffalo)

State University of New York (Stony Brook)

Syracuse University

Temple University

Texas A&M University

Texas Tech University

Tufts University

Tulane University

University of Alabama (Birmingham)

University of Arizona

University of Arkansas

University of California (Berkeley)

University of California (Davis)

University of California (Irvine)

University of California (Los Angeles)

University of California (Riverside)

University of California (San Diego)

University of California (San Francisco)\*

University of California (Santa Barbara)

University of California (Santa Cruz)

University of Chicago

University of Cincinnati

University of Colorado (Boulder)

University of Connecticut

University of Delaware

University of Florida

University of Georgia

University of Hawaii (Manoa)

University of Houston

University of Idaho

University of Illinois (Chicago)

University of Illinois (Urbana-Champaign)

University of Iowa

University of Kansas

University of Kentucky

University of Maryland (College Park)

University of Massachusetts (Amherst)

University of Miami

University of Michigan (Ann Arbor)

University of Minnesota (Twin Cities)

University of Mississippi

University of Missouri (Columbia)

University of Nebraska (Lincoln)

University of New Mexico

University of North Carolina (Chapel Hill)

University of Notre Dame

University of Oklahoma (Norman)

University of Oregon

University of Pennsylvania

University of Pittsburgh

University of Rhode Island

University of Rochester

University of South Carolina (Columbia)

University of Southern California

University of South Florida

University of Tennessee (Knoxville)

University of Texas (Austin)

University of Utah

University of Vermont

University of Virginia

University of Washington

University of Wisconsin (Madison)

University of Wisconsin (Milwaukee)

University of Wyoming

Utah State University

Vanderbilt University

Virginia Commonwealth University

Virginia Polytechnic Institute

Washington University

Washington State University

Wayne State University

West Virginia University

Yale University

Yeshiva University

\* No undergraduate degrees awarded

Appendix B

Membership of the Boyer Commission

Shirley Strum Kenny

President of the State University of New York at Stony Brook, Shirley Strum

Kenny has combined a teaching and research career with administrative

leadership. Widely recognized for her initiatives to build bridges between the

academic and business communities, she has been active in business and education

collaboratives on workforce issues. Dr. Kenny has taught at the University of

Texas, Gallaudet College, the Catholic University of America, the University of

Delaware and the University of Maryland. At Maryland, she was Chair of the

English Department and Provost of Arts and Humanities. She became President of

Queens College CUNY in 1985 and of Stony Brook in 1994. She serves on a number

of boards including Computer Associates International, Toys “R” Us, and the

Chase Manhattan Metropolitan Advisory Board. She previously served as Chair of

the Folger Shakespeare Library Institute Central Executive Committee, as Chair

of the Association of American Colleges and Universities, and as a board member

of the Carnegie Foundation for the Advancement of Teaching. Born in Texas, she

holds undergraduate degrees from the University of Texas, a master’s degree from

the University of Minnesota, and a doctorate from the University of Chicago as

well as several honorary degrees. Recipient of Woodrow Wilson, Fulbright,

National Endowment for the Humanities, and Guggenheim awards, she has published

five books and numerous articles on Restoration and eighteenth century British

drama.

Bruce Alberts

A respected biochemist and molecular biologist, National Academy of Sciences

President Bruce Alberts has dedicated much time to teacher improvement projects

such as City Science in San Francisco. One of the principal authors of The

Molecular Biology of the Cell, a textbook used widely in American colleges and

universities, Dr. Alberts has served on a number of prestigious advisory and

educational boards including Chair of the National Research Council’s Commission

on Life Sciences. Until his election as President of the Academy in 1993, he was

President-elect of the American Society of Biochemistry and Molecular Biology. A

native of Chicago, Dr. Alberts is a graduate of Harvard, from which he received

an undergraduate degree in biochemical sciences and his doctorate. In 1976,

after 10 years on the Princeton faculty, he was appointed professor and vice-

chair of the Biochemistry and Biophysics Department of the University of

California, San Francisco. In 1980, he was awarded an American Cancer Society

Lifetime Research Professorship at UCSF and in 1985 named department chair.

Known for his extensive study of the protein complexes that allow chromosomes to

replicate as living cells divide, he also co-authored Essential Cell Biology

(1998), a text designed to explain the subject to a more general audience.

Wayne C. Booth

Veteran educator and author Wayne C. Booth spent 30 years teaching at the

University of Chicago where he held the George M. Pullman Chair and is currently

a Distinguished Service Professor Emeritus in the English Department. His works

include The Rhetoric of English, Now Don’t Try to Reason With Me: Essays and

Ironies for a Credulous Age, The Company We Keep: An Ethics of Fiction, The Art

of Growing Older, and The Craft of Research. Born and raised in Utah, Dr. Booth

holds a bachelor’s degree from Brigham Young University and a master’s degree

and doctorate from the University of Chicago. He is a past President of the

Modern Language Association of America and has served on numerous executive

committees and commissions ranging from the National Council of Teachers of

English to the Commission on Literature of the National Council on Religion in

Higher Education. He is a past recipient of a Guggenheim Foundation fellowship

and has also been recognized by the American Academy of Arts and Sciences, the

National Endowment for the Humanities and Phi Beta Kappa.

Milton Glaser

One of the world’s best-known designers, Milton Glaser has been an active member

of both the design and education communities since the start of his career. His

work encompasses a wide range of design disciplines including print graphics,

environmental and interior design, and posters for the arts as well as

commercial projects and services. His graphic and architectural commissions

include the I§NY logo for New York State, an international AIDS symbol for the

World Health Organization, the logo for Tony Kushner’s Pulitzer Prize-winning

play, "Angels in America," and redesigns of an international collection of

publications including L’Espresso (Rome), Alma (Paris), The Washington Post, The

Village Voice and The Nation. He is co-founder of New York Magazine for which he

served as art director until 1977. Born in New York City, Glaser was educated at

the Cooper Union Art School, New York, and later, via a Fulbright Scholarship,

attended the Academy of Fine Arts, Bologna, Italy. The recipient of numerous

honorary degrees and awards, he teaches and is on the board of the School of

Visual Arts, New York City, and is a member of the board of Cooper Union. He is

a past President of the International Design Conference and served as Vice-

President and national convention co-chair of the American Institute of Graphic

Arts. His work is represented in the permanent collections of the Museum of

Modern Art, New York; the Israel Museum, Jerusalem; The Chase Manhattan Bank,

New York; and the National Archive, Smithsonian Institution, Washington, D.C.

Charles E. Glassick

Senior Associate of The Carnegie Foundation for the Advancement of Teaching,

Charles E. Glassick has long played a pivotal role in the shape and substance of

higher education. As President of Gettysburg College from 1977 to 1989, he was

named one of the 100 "most effective college presidents" in the country. Dr.

Glassick, who did his undergraduate work at Franklin and Marshall College,

Pennsylvania, and earned master’s and doctoral degrees in chemistry from

Princeton, served as Interim President of The Carnegie Foundation for the

Advancement of Teaching. A past Vice-Chairman of The Carnegie Foundation board,

he also was a senior fellow, assisting the late Ernest L. Boyer in preparing

major Carnegie reports including Campus Life: In Search of Community and

Scholarship Reconsidered: Priorities of the Professoriate. He is co-author of

Scholarship Assessed. Dr. Glassick was President of the Robert W. Woodruff Arts

Center, Atlanta, Georgia, from 1991 to 1995 and is the recipient of many

honorary degrees and awards.

Stanley 0. Ikenberry

Chairman of the Board of Trustees of the Carnegie Foundation for the Advancement

of Teaching and President of the American Council on Education, Stanley 0.

Ikenberry has been involved in higher education at the national level throughout

most of his career. Former President of the University of Illinois, he also led

the boards of the National Association of State Universities and Land Grant

Colleges and the Association of American Universities. Prior to assuming the

Presidency of the University of Illinois, Dr. Ikenberry was Senior Vice

President of Pennsylvania State University and was a professor in Pennsylvania

State Center for the Study of Higher Education. Born in Colorado, he received

his undergraduate degree from Shepard College, West Virginia, and his master’s

and doctoral degrees from Michigan State University. He holds eight honorary

degrees and has served on numerous commissions, boards and councils including

the Presidents Work Group on Accreditation of Higher Education in America, which

he chaired. He is on the board of Pfizer Inc., New York; UtiliCorp United,

Kansas City; and the National Museum of Natural History, Washington, D.C. Dr.

Ikenberry is also the author of numerous studies, articles and reports including

A Higher Education Map for the 1990’s.

Kathleen Hall Jamieson

Communicator and educator Kathleen Hall Jamieson is familiar to television

audiences as the result of her frequent appearances on The NewsHour with Jim

Lehrer and as a commentator for CBS News during national elections. Dean of the

Annenberg School for Communication at the University of Pennsylvania, she is

also a prolific author whose books and articles are widely respected by media

watchers and the general public. Her most recent book, written with Joseph

Cappella, is Spiral of Cynicism: Press and Public Good. She is a frequent

contributor to The New York Times, The Washington Post, The Philadelphia

Inquirer and The Chronicle of Higher Education. A graduate of Marquette

University, from which she received a bachelor’s degree, she holds a master’s

degree and Ph.D. from the University of Wisconsin. She was appointed Dean of the

Annenberg School for Communication in 1989 after a teaching career that took her

to the University of Maryland and the University of Texas, where she served as a

Professor of Communications and Chair of the Speech Communication Department.

The recipient of more than two dozen grants and fellowships, she has studied the

way the public learns about public policy through a Robert Wood Johnson grant;

has explored media, participation, finance and democracy with the aid of a

MacArthur Foundation grant; and looked at East-West Rhetoric as the result of a

National Endowment for the Humanities grant. She was also the recipient of Ford,

Fulbright and Knapp fellowships, an Eli Lilly Foundation grant and a grant from

the Andrew Mellon Foundation.

Robert M. O’Neil

Founding Director of the Thomas Jefferson Center for the Protection of Free

Expression, Robert M. O’Neil has been able to fold his vast knowledge of law

into the administrative workings of academia. He served as President of the

University of Virginia for five years and continues on its law faculty, teaching

courses in constitutional and copyright law. After serving as law clerk to

Supreme Court Justice William J. Brennan Jr., Dr. O’Neil began his teaching

career in 1963 at the University of California Law School at Berkeley. His

administrative career was born at the University of Cincinnati where he served

as Provost in the early 1970’s. He was Vice President of Indiana University at

Bloomington and later President of the statewide University of Wisconsin before

coming to Virginia. He taught law at each institution. A native of Boston, Dr.

O’Neil holds three degrees from Harvard and honorary degrees from Beloit College

and Indiana University. He is the author of several books including Classrooms

in the Crossfire and was General Counsel to the American Association of

University Professors from 1970 to 1972 and again from 1990 to 1992.

Carolynn Reid-Wallace

Former U.S. Assistant Secretary of Education, Carolynn Reid-Wallace has served

as Senior Vice President, Education and Programming, for the Corporation for

Public Broadcasting since 1993. In that role, she carries out the Corporation’s

commitment to provide and enhance educational services through public

telecommunications and evolving technologies. From 1991 to 1993, she directed a

staff of 1,250 federal employees and 10 regional offices concerned with the U.S.

Department of Education’s role in post-secondary education. It was an area close

to her heart. As Vice-Chancellor for Academic Affairs at the City University of

New York from 1987 to 1991, Dr. Reid-Wallace was chief academic officer of the

nation’s third largest urban university system. Her university-wide review and

redesign of teacher education programs was recognized as a national model by The

New York Times. Prior to directing a national program to increase the

effectiveness of humanities education in America’s schools for the National

Endowment for the Humanities, Dr. Reid-Wallace held several positions at Bowie

State College, Maryland, including the Acting Presidency, and taught at Grinnell

College, The George Washington University, Howard University, Washington, and

Talladega College. The recipient of a Ph.D. degree in English and American

Literature from The George Washington University, she has been a Rockefeller

scholar, a Ford fellow, a John Hay Whitney alternate, and a Fulbright lecturer.

Chang-Lin Tien

The first Asian-American to head a major research university in the United

States, Chang-Lin Tien became seventh Chancellor of the University of California

at Berkeley in 1990. Internationally recognized for his research in the field of

heat transfer technology, he is the recipient of many honors including a

Guggenheim Fellowship and the Max Jakob Memorial Award, the highest honor in the

field of heat transfer. Anchored in both American and Asian cultures, Dr. Tien

is deeply committed to maintaining excellence and to broadening the democratic

reach of higher education to all groups. Born in China and educated in Shanghai

and Taiwan, he came to the United States in 1956 and earned a master’s degree at

the University of Louisville in 1957. He then earned a second

master’s and a Ph.D. degree at Princeton in l959, the same year he joined the

Berkeley faculty. A recipient of honorary degrees from several universities, he

currently serves on the Board of Trustees at Princeton, the Asia Foundation, and

Wells Fargo Bank. He has published more than 280 journal articles, has been

editor of three international journals, and has guided more than 60 students to

the doctorate.

Chen Ning Yang

Nobel Prize winning physicist, Chen Ning Yang directs the Institute for

Theoretical Physics at the State University of New York at Stony Brook, where he

also holds the title of Albert Einstein Professor of Physics. Born in China, he

received his doctorate from the University of Chicago in 1948 and joined

Princeton’s Institute for Advanced Study in 1949, where he served as a professor

from 1955 until 1966, the year he came to Stony Brook. Dr. Yang is a member of

the U.S. Academy of Sciences; the Academia Sinica, Taiwan; and the American

Philosophical Society. He also belongs to the Russian Academy of Sciences, the

Royal Society, London; and several other academies. In addition to the Nobel

Prize, which he won in 1957, Dr. Yang is the recipient of the Rumford Premium,

the National Medal of Science, the Benjamin Franklin Medal, the Bower Prize, and

the N. Bogoliubov Prize, which he received in 1996. He holds more than a dozen

honorary degrees including an honorary Doctor of Science degree from Princeton.