

In the seventy-odd years since the National Academy of Sciences started keeping tabs on the sources of American scientists and scholars, the undergraduate colleges have markedly outperformed the universities in the percentages and sometimes even in the total numbers of graduates going on to get doctorates in all fields, not just in the sciences. Twentyfive years ago, a Congressional committee report pushing for a larger share of funds for the productive schools said there was “absolutely no relationship between the allocation of Federal science education funds and improvement in the quality of undergraduate teaching.” It said that the popular assumption was that the universities were the prime source, but that in reality the reverse was true. Using prizes and awards won for graduate study as criteria, the committee found that thirty-four of the top fifty institutions were colleges. And of the sixteen universities, five were technical institutions specializing in the sciences.

TABLE A

The sixty-six colleges whose medical school applicants' scores on the science part of the Medical Test averaged 550 or over for eight administrations of the test.

CalTech	628	Lafayette	568
Brooklyn College	616	Columbia	567
Harvey Mudd	615	Franklin and Marshall	567
Yeshiva	613	Johns Hopkins	566
Chicago	608	Radcliffe	566
Cornell U.	600	Mublenberg	565
		Haverford	563
Queens	596	Dartmouth	562
Rensselaer	596	McMurry (Texas)	562
MIT	596	Williams	562
Cooper Union	592	Duke	561
Yale	590	Wesleyan	560
Brown	588	Bowdoin	560
Pembroke	586	Middlebury	560
Carleton	585	Colgate	560
Rice	585	Trinity (Conn.)	560
Swarthmore	584	Penn	560
Pomona	583		
Harvard	582	Grinnell	559
Augsburg	581	Ohio Wesleyan	558
		Northwestern	558
Brandeis	579	UCLA	557
Clarkson	579	Berkeley	557
Wabash	578	Calvin	556
Union	577	St. Thomas (Minn.)	555
Barnard	576	Boston College	554
Hamilton	576	Illinois Institute	
Rochester	575	of Technology	553
Western Maryland	575	Wooster	553
Lehigh	572	UC-Davis	553
Oberlin	572	UC-SC	551
Occidental	572	Penn State	550
Reed	572	Delaware	550
Princeton	570	Washington U. (St. Louis)	550
Stanford	570	Denison	550

Finally, in 1985, a group of undergraduate colleges, pushed into it by severe money worries, made a concerted effort to tell their story. In this company, chest-beating isn't genteel. Colleges use every tool of marketing to compete for the supply of teenagers, but their code makes it unprofessional and gauche to tell the world how good they are or how the competition falls short. So they make no invidious comparisons with the assembly-line universities, either in quality of undergraduate experience or in productivity of useful citizens. A college president is loath to declare publicly that a student is lucky to get the time of day from a university faculty member, or that a place like Earlham, Eckerd, Wooster, Hampshire, or Guilford makes the big ones look like inferior merchandise.

The presidents of forty-eight colleges met at Oberlin in 1985 to call attention to the clear superiority of their institutions for the education of scientists and to press their case for a fairer share of Federal help. After a long period of Reagan cutbacks, the colleges' science facilities faced the need for billion-dollar infusions of money to maintain their standards. The colleges, unlike the universities, pretty much pay their own way. Only 15 percent of their cost of laboratory equipment comes from Washington, whereas the twenty top research universities get 52 percent. Because of their big staffs and extensive laboratories and because they have the clout, the universities win the lush research grants that pay them so handsomely.

It took Oberlin provost Sam C. Carrier, and David Davis-Van Atta, its director of institutional research, two years to dig up the facts for their story because so little had been done to discover the outcomes of the college experience. That is one reason why so many good schools have so long been underestimated. The Carrier and Davis-Van Atta figures were updated in 1987.

What they documented was that fifty small colleges outdo twenty top-rated research universities—most of them big—in producing scientists. And when quality is compared, the

colleges rank at or near the top of all institutions. Of the top ten in quality of product, six are colleges. The fifty colleges are listed in Table B (page 117).

It isn't surprising that the universities get the credit for being the greenhouses for scientists when the academicians themselves don't know the story. As Mr. Carrier said, "I always knew that these colleges were productive in that area, but the magnitude of their productivity surprised me."

A full 25 percent of all recent graduates of the colleges were science majors, half again that of the twenty universities. "A most significant point," the 1987 report said, "is the approximate equivalency between the 50 liberal arts colleges and the 20 top-rated universities in absolute volume...."

What's more, the Oberlin report said, the quality of the liberal arts scientists has been as good as those of the universities. It used six criteria, such as National Science Foundation fellowships, listings in the directories of leading scientists, and membership in the prestigious National Academy of Sciences, to show that these colleges "unfailingly ranked equally with the best universities at the undergraduate level." Indeed, most of the top twenty-five institutions turned out to be colleges. When all fifty colleges were compared with all twenty universities, the latter held an edge so modest as not to permit any bragging rights. In short, the report said, the colleges are "clearly" producing scientists as good as those from the best research universities.

In an article on the origins of American scientists, the *Accounts of Chemical Research* said, "The data in these reports demonstrate that . . . those [institutions] that are excellent for graduate education turn out to be less excellent for undergraduate education."

The top universities didn't even produce many of their own faculty. Only 18 percent were undergraduates of one of the top twenty. But 30 percent of them had gone to one of the fifty colleges. Furthermore, professors from Harvard and the universities of California and Texas who took part in the Oberlin study made a point of saying that the quality of

TABLE B

The fifty liberal arts colleges, participating in the Oberlin conference on the future of science at liberal arts colleges.

Albion	Kalamazoo
Alma	Kenyon
Amherst	Lafayette
Antioch	Macalester
Barnard	Manhattan
<i>Bates</i>	Middlebury
Beloit	Mount Holyoke
Bowdoin	Oberlin
Bryn Mawr	Occidental
Bucknell	Ohio Wesleyan
Carleton	Pomona
Colgate	<i>Reed</i>
Colorado	Smith
Davidson	St. Olaf
Denison	Swarthmore
DePauw	Trinity (Conn.)
Earlham	Union
Franklin and Marshall	Vassar
Grinnell	Wabash
Hamilton	Wellesley
Hampton University	Wesleyan
Harvey Mudd	Wheaton (Ill.)
Haverford	Whitman
Holy Cross	Williams
Hope	Wooster

education in the good small liberal arts colleges such as they had attended was “unparalleled during this crucial development period.”

In his introduction to the report, Oberlin president Frederick Starr made a point that everyone looking at colleges, whatever his field of interest, should keep in mind. The success of these colleges, he wrote, “is due significantly to the close link between teaching and faculty research that exists

on such campuses. No amount of research and scholarly activity will benefit the undergraduate if this vital interaction does not take place in significant quantity. Such contact with distinguished faculty is perhaps the primary hallmark of undergraduate science education at the 48 liberal arts colleges.”

The conditions conducive to highest quality science education, as Dr. Boyer’s team had said in their book, *College*, “are typically not found at major research universities.” College faculty devote nearly 55 percent of their time to teaching. At the universities faculty spend 33 percent of their time in research and only 29.6 percent teaching, which includes substantial teaching of graduate students.

The Oberlin study demonstrated that student participation in research is far, far greater at the colleges. It found that nearly one third of the nearly seven thousand professional journal articles by faculty in the forty-eight colleges over a five-year period had been co-authored by students. Students also co-authored 8 of the 351 books published by faculty members and one in five of the papers presented to professional meetings.

While comparable data for the universities are sparse, an article in *Chemical and Engineering News* quoted Robert West, professor of chemistry at the University of Wisconsin, as noting that less than 1 percent of the undergraduates carry out research in chemistry in any one year, and that only “about four to five percent of the chemistry papers published by UW scientists had been co-authored by undergraduates.” West said that “a major disadvantage is that undergraduates require a lot of supervision and training; the return on the time and money invested in them is seen as not worthwhile.”

In 1987 the University of Colorado’s undergraduate research program had forty-six students in thirty-five departments involved in a school of over twenty thousand students. Applicants literally have to go through the process of applying for and winning a grant, whereas in the good small college almost any serious student with the desire can get involved in research with a faculty member.

The Colorado program is patterned after programs at MIT, UCLA, Stanford, and the University of Minnesota.

While the Oberlin findings applied only to the science area, a much broader study about the same time demonstrated that schools that have high standards in one area are likely to have them across the board. The twelve colleges of the Great Lakes Colleges Association commissioned Carol H. Fuller to find out which of fifteen hundred colleges and universities had produced the highest percentages of graduates who went on to earn Ph.D.'s in all fields between 1951 and 1980. Not only were most of them liberal arts colleges, but many were colleges that have never been particularly selective. The ranking of the top fifty appears in Table C (page 120).

Three leading technical institutions headed the list because of their heavy productivity in the sciences, but they weren't in the competition in the humanities.

Dr. Fuller also discovered that the colleges in the Great Lakes association were far more productive of scholars and scientists than the eight Ivy League universities. And the twelve colleges of the Associated Colleges of the Midwest outdid the leading universities of their region, the Big Ten.

Having shown that "little David was small, but oh my!", Dr. Fuller urged some broader consumer research that is long overdue; namely, finding out which colleges or universities have turned out the leading corporate executives, political leaders, winners of various prizes and recognitions, and people with a special commitment to service, such as Peace Corps volunteers.

The nearest approximation of such data that is readily available are the listings in *Who's Who*, a compendium of highranking national and state government and judicial officers, top-ranking military officers, high-ranking officials of major cities, and the elite of business, cultural, church, educational, philanthropic, and professional organizations, as well as recipients of major honorary awards and such prizes as the

TABLE C

Top fifty institutions in Ph.D. productivity, 1951-1980, based on percentage of graduates.

	ALL FIELDS		HUMANITIES		SCIENCE	
	<i>Total</i>	<i>Percent of Graduates</i>	<i>Total</i>	<i>Percent of Graduates</i>	<i>Total</i>	<i>Percent of Graduates</i>
Harvey Mudd	257	40.7	5	0.8	247	39.1
Caltech	1818	40.0	17	0.4	1781	39.2
Reed	968	25.3	154	4.0	766	20.0
MIT	5438	20.9	114	0.4	5141	19.8
Swarthmore	1418	20.9	350	5.2	975	14.4
Haverford	683	18.8	196	5.4	415	11.4
Oberlin	2321	17.8	666	5.1	1347	10.3
New College (Fla.)	63	16.1	13	3.3	48	12.2
Chicago	3805	15.6	781	3.2	2592	10.6
UC-San Diego	362	14.1	28	1.1	325	12.6
Amherst	1118	13.7	363	4.5	642	7.9
Carleton	993	13.7	253	3.5	631	8.7
Cooper Union	602	13.7	3	0.1	586	13.4
Pomona	1066	13.7	224	2.9	713	9.2
Brandeis	893	13.5	218	3.3	578	8.7
Wabash (Ind.)	501	12.9	105	2.7	324	8.4
Rice	1501	12.4	229	1.9	1192	9.9
Webb Institute (N. Y.)	52	12.4	1	0.2	47	11.2
Wesleyan (Conn.)	877	12.4	255	3.6	511	7.2
Bryn Mawr	593	12.0	282	5.7	276	5.6
Princeton	2713	11.7	741	3.2	1765	7.6
Grinnell	706	11.4	168	2.7	450	7.3
UC-Irvine	299	11.3	37	1.4	253	9.5
Eckerd	119	11.2	33	3.1	77	7.2
Antioch	875	11.0	131	1.7	620	7.8
UC-Riverside	897	11.0	126	1.5	709	8.7
St. John's (Md.)	117	10.4	55	4.9	49	4.4
Wooster	868	10.4	190	2.3	517	6.2
Radcliffe	923	10.2	357	3.9	469	5.2
Davidson	599	9.9	179	2.9	306	5.0
Williams	835	9.8	255	3.0	507	6.0

T A B L E C (cont.)

Top fifty institutions in Ph.D. productivity, 1951-1980, based on percentage of graduates.

	ALL FIELDS		HUMANITIES		SCIENCE	
	<i>Total</i>	<i>Percent of Graduates</i>	<i>Total</i>	<i>Percent of Graduates</i>	<i>Total</i>	<i>Percent of Graduates</i>
New School (N.Y.)	99	9.7	30	2.9	57	5.6
Barnard	1163	9.5	426	3.5	590	4.8
Hamilton (N.Y.)	507	9.4	181	3.3	255	4.7
Kalamazoo (Mich.)	427	9.3	70	1.5	307	6.7
Earlham	476	9.1	87	1.7	308	5.9
Harvard	5554	9.0	1551	2.5	3527	5.7
Rensselaer	1929	9.0	26	0.1	1819	8.5
Polytechnic Institute						
Bowdoin	578	8.8	156	2.4	345	5.3
UC-Santa Cruz	262	8.8	59	2.0	192	6.5
Cornell	5329	8.8	595	1.0	4213	7.0
Johns Hopkins	1524	8.7	204	1.2	1207	6.9
CUNY: City Colleae	6893	8.6	797	1.0	4990	6.2
Rochester	2056	8.4	483	2.0	1288	5.3
Wellesley	1002	8.4	390	3.3	461	3.9
Yale	3407	8.4	1085	2.7	1996	4.9
Brown	1977	8.3	405	1.7	1388	5.8
Carnegie-Mellon	1678	8.3	90	0.4	1422	7.0
Occidental	780	8.2	134	1.4	464	4.9
Kenyon	348	7.9	120	2.7	202	4.6
Group Total	70269	11.0	13418	2.0	49890	7.9

Here is the list, with the index number for each:

- | | | | |
|----|--------------------|----|-----------------------------|
| 13 | Yale | 67 | Antioch |
| 15 | Harvard | 68 | Pennsylvania (U. of) |
| 16 | Princeton | 69 | Bowdoin |
| 20 | Chicago | 71 | Brown |
| 21 | Caltech | 72 | Knox |
| 23 | Amherst | 74 | Ohio Wesleyan |
| 24 | Williams | 76 | Carleton |
| 25 | Columbia | 77 | Union |
| 27 | CCNY | | Virginia Military Institute |
| | Swarthmore | | Grinnell |
| 29 | Dartmouth | | Vanderbilt |
| 30 | MIT | 78 | Hampden-Sydney |
| 36 | Haverford | | Bryn Mawr |
| | Washington and Lee | 80 | Cornell College (Iowa) |
| 41 | Oberlin | 84 | Kenyon |
| 44 | Reed | | Sewanee (U. of the |
| | Stanford | | South) |
| 49 | Davidson | 86 | Beloit |
| 50 | DePauw | 87 | Duke |
| 52 | Wesleyan | 88 | Wooster |
| 53 | Northwestern | 89 | Washington U. (St. Louis) |
| | Pomona | 92 | Illinois Institute of |
| 55 | Cooper Union | | Technology |
| 56 | Wabash | 93 | Occidental |
| 57 | Wheaton (III.) | 95 | Notre Dame |
| 58 | St. John's College | | Rice |
| | Holy Cross | | Millsaps |
| 59 | Johns Hopkins | 97 | Denison |
| 61 | Hamilton | | Franklin and Marshall |
| | NYU | 98 | Bard |
| 66 | Colgate | | |

The best-known universities with index numbers under two hundred were:

104 Michigan	138 Illinois
105 Georgetown	139 UC-Berkeley
109 Fordham	140 Emory
112 Catholic	146 North Carolina
125 Carnegie-Mellon	150 Southern Methodist
126 Wisconsin	156 Minnesota
128 Syracuse	158 Tufts
133 George Washington	163 Virginia
134 Rochester	174 Case Western
137 Tulane	

Quite a few of the very popular universities did poorly:

202 Texas	256 U. of Washington
205 Georgia Tech	260 Ohio State
208 Southern California	267 Indiana
William and Mary	268 Colorado
233 Miami (Ohio)	277 Boston College
251 Rensselaer	280 Boston U.

And some well-known universities ought to be ashamed:

313 Miami (Florida)	463 Kentucky
349 Connecticut	474 Georgia
361 Rutgers	489 Vermont
393 Drexel	629 Maryland
395 Penn State	694 American
397 Michigan State	1011 New Hampshire
400 Florida	1065 Delaware
426 Texas A & M	

Nobel and Pulitzer. It is not possible to get a mention by buying the directory.

A search of the eighty thousand listings in the 1988-1989 edition, completed for this book, make the small colleges—and often the little-known ones—look as dramatically superior to the universities in the world of doers as in the world of savants and scientists. Of course, *Who's Who* listings are just one more indication, but they do buttress and complement the small-college claims that they are the stone the builders rejected that has become the head of the corner.

This, however, is not news; in general our findings restate those of a search made thirty years ago by the Educational Records Bureau (ERB) in New York. With Easterners panicking about getting into a good college, the ERB did a search of the 1956-1967 *Who's Who* “to discover whether there were good colleges outside of the East.” The answer was an emphatic yes, based on the production of achieving alumni.

That survey, like this one, found that Yale led the list, with Harvard and Princeton close behind. Amherst, Oberlin, and Williams were virtually tied for fourth. Of the top sixty colleges, forty-nine were in the West, Midwest, and South, and most of them were colleges with names unfamiliar to people in other parts of the country.

For this survey, the average number of graduates for 1980–1986 was multiplied by twenty, to get a workable base number, and then divided by the number of *Who's Who* mentions. This produced fifty-nine schools with index numbers below one hundred. Only eighteen of them were universities, and twenty-nine were in the West, Midwest, and South. This does not do justice to several colleges that in recent years have changed character by going coed, like Vassar or Sarah Lawrence, or that are still too young, like Hampshire, Pitzer, or Eckerd, to have a sizable body of mature alumni.

Furthermore, some of the top-ranked research universities hardly got on the scoreboard.

The small colleges do far better for the student than the state universities in the quality of life outside of class too.

Donald O'Dowd, president of the University of Alaska, when he was executive vice chancellor of the vast State University of New York system, was quoted in *The New York Times* as saying:

“In exchange for higher cost, students at private institutions usually get a richer array of services, including better student-teacher ratios, better student life and athletic programs than are possible with the funds available at public institutions.”

George Drake, former president of Grinnell College, writing in *The Chronicle of Higher Education*, pointed out that most small colleges offer more varsity sports for more Students than do state universities. This may come as a surprise, but “fewer than five percent of the students at large universities participate in varsity sports, whereas at small colleges the figure is close to 40 percent.” And when intramurals are included, the majority of students are involved.

In 1889, in the first football game west of the Mississippi, Grinnell beat the University of Iowa 24-0 in a game played by students “and maybe a ringer or two for the fun of it.” But since then, Drake added, “a chasm has opened.... Bigtime intercollegiate sports have become the property of the public. They are entertainment for the millions rather than extracurricular outlets for students.” In small colleges all varsity sports are supported from general funds because athletics are part of the educational program, “and athletics are educational.... The contrast could not be starker.”

In their nationally televised football game commercials, the major university's blurb may show students walking across a well-treed campus with the narrator saying something like, for example, “Michigan State's excellent academics are complemented by athletics.” Malarkey. Students at Michigan State are even less involved in intercollegiate athletics than they are in their own educations, unless they're in one of the elite residential colleges.

Martha Peterson, who had been a dean at the University of Wisconsin before becoming president of Barnard and later

of Beloit, became a convert to the small colleges, which she says “are special places of teaching and learning . . . in which the teacher and learner face each other almost daily. Formally or informally, they pursue knowledge, explore ideas, ask questions, explore current events, and share personal experiences. There is no place on the small college campus for either the professor or the student to hide. The years spent in such a challenging, non-anonymous environment offer unparalleled preparation for living in an unpredictable world.”

A search could reveal millions of cases like that of a client father who said, “I went to Marquette; the doctor next to me graduated with honors from Yale. We’re both doing the same work.” In short, the clout is not in the name, the size, or the place of the college; it is in the student himself, and the best college is the one that will contribute most effectively to his growth and development in these last and crucial formative years of youth.