

Mr. President, friends and fellow-teachers -- it is with understandable feelings of inadequacy that anyone would approach the subject of research in ^{the} liberal arts college ^{In the face of the magnificent work and particularly in his classroom.} while standing in front of Harry Lewis. ^{Not only is Harry clearly the master of this broad subject,} but knowing him as I do, it is likely that ^{on even} ^{my} ~~some~~ ^{specific} ~~topic~~ ^{research} at Wabash College -- he is more thoroughly informed than I.

Over the past ten years there have been a great number of very productive meetings and panels concerning themselves with research in undergraduate institutions, and Harry has played a major roll in all of them. Indeed, the Lewis Law P = ~~LC~~ ^{has} now assumed for teachers the authority that Parkinson's Law carries for administrators. ^{Harry's} ~~will be distributed~~ ^{will be distributed} ~~by Bob Rosenberg in Harry's absence.~~ ^{as your program shows, he talking to us tomorrow and bring us up to date on the broad picture of research in the MACTLAC schools. ^{For} ~~my own comments I would like to step back a little from the triptych of money, time and ideas, ~~which~~ ^{even though these} ~~have~~ ^{been} ~~rewardingly~~ ^{used} as a framework on which to ~~discuss~~ ^{study the means of stimulating} research in the liberal arts college. Instead, I would like to nudge a few icons concerning the way in which research most effectively contributes to the undergraduate education.~~}

^{At most meetings} It has ~~always~~ been pointed out with care, I believe, that the value of research in determining productivity indices is not necessarily tied directly to research participation by students, but can also be derived from the students' contact with ^{the} ~~active~~ ^{active} vital attitudes that personal research activity creates in his teachers. Once this has been acknowledged however, the discussion is ^{usually} ~~devoted~~ ^{devoted} entirely to the ^{former} ~~alternative~~ ^{alternative}, student participation in research programs. ^{Now} ~~we~~ ^{we all} ~~recognize~~ ^{recognize} that in spite of roughly equivalent courses in instruction and overall curriculum, our schools

vary enormously in the time available to chemistry majors, particularly in their senior year. Here at Wabash the demands on our seniors' time during the academic year are such as to all but preclude a real involvement in a research problem. ^{This bothered me when I first came here, but} Now, on reflection, I discover that even if it were in my power to do so, I doubt/~~if~~ ^{that} I would change our program in a way that would provide time for this research. ^{Why? Because} ~~the~~ time spent on research is ^{necessarily} time not spent on other things -- and the value of the other things must be weighed against the value of the research experience. ~~As a~~ ~~course, time spent on student research, is time not spent on faculty research, but rather ^{time} spent teaching the research techniques.~~

Certainly the basic ~~aim~~ of a liberal arts college is not to train a technical specialist, but quite the contrary, to produce a man who ideally would never become so immersed in his own specialty that he lost a love for learning in quite different disciplines. ^{if} So, given ~~an~~ ^{the} individual student, and of course all the students are individuals, it is appropriate to ask -- would the student become a better man, contribute more to the world, and derive more of the world's sweetness by involvement in a research project -- and all that that implies with respect to both learning techniques and acquiring academic closeness to a mature ~~faculty~~ ^{faculty} member -- or would he profit more by seizing, for what is almost certainly the last opportunity of his life, ~~immersion~~ ^{immersion} in German literature, sociology, or political science. I think that for most students preparing to leave their liberal arts college for graduate training in a university, I could argue strongly against ~~research participation as part of the academic program on these terms.~~ ^{if} This, of course, leaves summer open as an option. Given two summers between the junior and senior years and between senior and graduate years, I think something can be done. But given a single summer I have real personal

reservations. Starting from scratch, a ten week period provides a chance for research contribution only with certain types of problems; and to adopt this type of program it ~~is~~ ^{order} to provide the ten-week research experience can push a faculty member out of research areas in which his real interest and skills lie. ^{with respect to the faculty member of course, the time spent with student research is time not spent on faculty research, but rather time spent teaching the research techniques}

Now, clearly professional research activity can be carried out with an undergraduate to ~~an~~ ^{the} enormous ~~satisfactoriness~~ ^{satisfactoriness} of both ~~the~~ student and teacher alike. But what I am saying is that my experience at both Wesleyan and Wabash suggest ~~that~~ that this student is the exception, and I have been considering here ^{the student who is} more the rule. ^{I would} Thus ~~we~~ argued that, weighing ~~them~~ ^{their contributions} against one another we might properly give more attention and discussion to the alternative to student research participation. ⁱⁿ Namely, ^{contribution to} productivity provided by a faculty member alive by virtue of ^{his} continued action as a professional, that is, as a research chemist, and ^{very} ~~importantly~~ ^{importantly} as a model upon which his students can ~~profitably~~ ^{profitably} build their professional image.

From this point on, then, I would like to address myself to this research activity of the form that I call individual research. ^{when this term} ~~was~~ ^{suggested} itself a few weeks ago its meaning seemed completely obvious to me. Now when I must express it I am not so sure. I suppose I have chosen it to convey something characteristic about the work I have pursued for the last 11 years, but the most characteristic ^{property} ~~property~~ this work exhibits is its low density, and perhaps the term "individual" is meant in some degree to justify this. I don't really know. However, I do believe that the ~~almost~~ almost completely personal nature of my work over these years has added a professional maturity of a kind which would not have come in other ways.

organization.

Of course, the ~~type~~ of research one carries out is usually determined by the type of institutional employment. There are, to be sure, rare individuals who, even within a large university, manage to keep research to themselves, just as there are those in quite small colleges who ^{have} manage to build veritable research empires. But, in general, a person in a small college is, if he works outside of ^{the} ~~the~~ student participation framework, bound to be working alone.

Now I want very much to justify this type of work if I can, because I have observed that many young men have been discouraged from a career in teaching in a small school - for, right out of graduate school research is their life, and ^{they} feel if they cannot get a position in a university they prefer to go into an industrial laboratory where something will be sure to be going on. There are, of course, some good reasons for discouragement. A new Ph.D. would like to think that he is done with dirty work, and the idea of a limited library and a few instrumental tools available ~~is~~ ^{is} frightening. The fact that there will probably be no one ^{there} against whom to test his ideas is discouraging and the selection of a problem seems to be an insurmountable obstacle, for if he is working on a "hot" problem, clearly it will appear "hot" to others, and how could he compete with large research groups? The alternative of working on a "non-hot" problem for some reason or another always conjures up in the mind of an organic chemist the synthesis of innumerable esters ^{of} ~~of~~ a new but readily available acid, and to other disciplines equally uninspiring work. The point on which I try to encourage such students is that it is possible and reasonable to carry out individual work that is as professionally satisfying and rewarding as group work. Actually the biggest obstacle to individual research is none of those that first strike the teacher, - rather it is a lack of simple pressure. I could ^{support} ~~be~~ this ^{in many ways} ~~in many ways~~ ^{even} actually, I could argue that the presence or ~~s~~ absence of financial support, commonly viewed as critical to sustain research activity.

is primarily a factor of absence or presence of pressure, rather than the absence or presence of a material necessity. But ~~pressure~~^{mostly} the size and kind of institution is responsible for the lack of pressure - for in a small institution few really give a damn whether you do research or don't do research. If you do no scholarly work at all it is a rare liberal arts college where this in itself would evoke criticism. By the same token the climax of a piece of work that has consumed your energies for five years may be greeted with politeness but one certainly could not expect genuine appreciation or even understanding of its significance. ~~It~~ However, if by the development of an introspective appreciation of one's own work, this obstacle of lack of pressure can be overcome -- the more practical problems I mentioned earlier ~~are~~ discovered to be minor indeed. ~~In~~ In individual research one can watch an idea grow and mature within ~~one~~^{one} rather than having it ripped untimely from the ~~web~~^{web} by responsibilities that can be discharged only ~~by~~^{the scheduled} regular and frequent publication ~~demanded~~^{demanded} by a university. ~~It~~, I suppose, that the most addicting thing about individual research is the completely undiluted thrill of discovery that it provides. This thrill remains qualitatively just the same as those early ones which came with the first chemistry ~~set~~^{set}. Those which probably were the beginnings of ~~the~~^{our} choice ~~of~~ chemistry as a profession.

Now, of course, ~~these~~^{such} emotions are highly personal emotions, and my attitudes highly personal attitudes -- so individual emotions, individual attitudes and individual research ~~it~~^{it} must be.

Well, fortunately we all have our own ideas about research and ~~prestige~~^{perse} ~~in~~ each ~~of~~^{of} them ~~with~~ with vigor, ~~and~~ within the science faculties here at Habash, we run the entire spectrum in nine or ten distinct projects -- from Paul McKinney's completely solitary calculations in molecular mechanics through Professor Haenisch's strictly summer activities with student participation ~~program~~^{program}.

~~program~~ to ^{our} ~~the~~ physics department's year-around project involving all
 of its faculty and some of its students. ^{But I will do ~~my~~ work, no matter what its form} we each respond to our professional
~~work~~ ^{as teachers} research.

other-life

And now I would like to invite all of you to visit freely the
 projects and facilities that are outlined on the back of your program sheet.
 There will be responsible individuals at each location to answer questions
 about any of the research programs listed -- and if you need another map
 they will be found at the door on your way out.

Remember there will be refreshments in the Campus Center Lounge
 served from 9:30 to 11:00 o'clock tonight.

Thank you.