CONF - 750607 - 2

A N.E.E.D.-RELATED PROGRAM
AT THE SAVANNAH RIVER PLANT

by

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A Paper for Presentation
Special Session Sponsored by
ANS Nuclear Engineering Education for the
Disadvantaged (N.E.E.D.) Committee
21st Annual Meeting of the American Nuclear Society
New Orleans, Louisiana
June 10, 1975

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INTRODUCTION

This paper describes some activities that are carried out by the Du Pont Company at the Savannah River Plant and that are closely related to the objectives of the ANS Nuclear Engineering Education for the Disadvantaged (N.E.E.D.) Committee. Principal emphasis is placed on a particular activity carried out in connection with our Cooperative Education Program. This activity now represents collaboration with the three nearest engineering college programs that have predominantly black enrollments and offer ECPD accredited engineering degrees.

The Savannah River Plant is a large nuclear production facility located in South Carolina on the Savannah River near Augusta, Georgia, about 100 airline miles inland from the coast. The Plant was designed, built and operated under cost reimbursement prime contract for a segment of the U.S. Atomic Energy Commission which has now been replaced by the Energy Research and Development Administration. The scope and nature of our production-oriented operations for ERDA give us heavy involvement with engineering in the nuclear field, although only a minor portion of our engineering requires training in Nuclear Engineering as recognized for formal academic guidelines. Most of our engineering needs lie in older "traditional" areas of chemical, mechanical, electrical, metallurgical, and industrial areas, with nuclear toward the lower end of this spectrum percentagewise. Nevertheless, the strong nuclear and engineering orientation of our work, together with our positive efforts to encourage the opening of our engineering employment opportunities to the now heavily under-represented black and female segments of our population, give us the strongest kind of ties with the objectives of the N.E.E.D. Committee.

DISCUSSION

At the Savannah River Plant Du Pont presently employs about 5000 people in our operating force. About 1600 of these are in supervisory or technical positions and about 1000 are college-trained - about 500 with the highest degree in some branch of engineering and about 400 in one of the sciences. Figure 1 shows our major operations. We presently operate three large production reactors cooled and moderated by heavy water; we fabricate our own nuclear fuel and target elements in wide variety; we operate two large chemical plants to process the irradiated reactor fuels and targets to ERDA - prescribed forms for transfer or retention; we operate the country's only large-scale heavy water production facility; and approximately 20% of our people are engaged in various aspects of a substantial R&D program in support of these production activities. We are self-sufficient in our maintenance, plant engineering, health physics, environmental surveillance, plant technical and other such important functions. Our interests in engineering education and in nuclear applications thus are strong and vigorous.

In our effort to stimulate minority races in our education-related work programs we have emphasized black participation. The black population in our geographical area approximates 29% of the total, in contrast to insignificant proportions of native and Spanish Americans.

Before coming to our cooperative education program, two other activities warrant mentioning relative to N.E.E.D. objectives: summer employment and our "honors program" for undergraduate student projects on the site.

Figure 2 gives the average number of participants in our summer employment programs over the four year period through this summer. The data indicate our commitment to minority engineering education when one considers the small proportion of such faculty members and students who are available in comparison to the total numbers in non-engineering disciplines. Another factor is that the ERDA Faculty Research Participation and Undergraduate Research Trainee Programs, under which most of our summer faculty members and undergraduate students are employed, have commonly in the past emphasized research rather than engineering.

The modest activity that we call our Honors Program was started in 1972 with the objective of giving small local colleges in our area an opportunity to have an occasional superior undergraduate student do an independent project under the joint guidance of a faculty member and a selected member of our scientific staff. Most of the small schools that have considered participating are predominantly black. The faculty members involved have especially welcomed the opportunity for a student to do a special project, since typically their teaching loads provide little opportunity to oversee such work themselves. A student appointed under this fellowship-type program is not an employee, and receives only a small reimbursement designed to compensate for the added housing and/or transportation cost associated with the on-site activity. He or she must be registered at his school, and the faculty advisor is responsible for assuring appropriate academic credit for the project.

As a consequence of the limitation to small local schools the students in this program have been majors in science or mathematics rather than in engineering. However, the applied nature of the activity is so closely allied to engineering objectives that the program seems appropriate to mention. Of 16 students who have participated in the program since inception, 8 have been of minority race, all black.

Cooperative education is, in our view, the program which offers the best mutual advantages between engineering education and the practical application which definition specifies as its end result. The essential ingredients of cooperative education as used in this paper are:

1. Alternating sequences on campus and at committed work assignments.
2. Planned work assignments, each challenging the student's capability at his current academic level and thus offering highly applicable experience.
3. Extension of the program through enough academic training and work experience for meaningful mutual interaction among student, college, and employer.
4. Active participation, evaluation, and follow-up by all three participants.

Cooperative education within those guidelines has been a strong program in a number of the country's finest engineering colleges for many decades. Within the past few years a number of factors, including both specific federal funding and an increased awareness of the value of practical experience, have increased both the number of participating engineering schools and the spread of the program into business and liberal arts curricula.

At the Savannah River Plant we have had a strong co-op program since 1957, our numbers gradually increasing as we have gained confidence. For directness of communication and liaison we have not expanded geographically beyond schools in the Southeast. We have justified our program as a definite part of our recruiting effort for new permanent technical employees, and we have therefore kept it small enough to maintain it at a stable level and to try to have a permanent opening possibility for each student upon graduation. Figure 3 indicates the current scope of our co-op program. We are very pleased with the participation of minority engineering students in it. We have always been well impressed by the quality of the co-op students who have been recommended to us by the schools with which we participate. We welcome the fact that the co-op program directors and the general atmosphere of most cooperative education programs stress the fact that co-op student employees are expected to earn their pay as well as obtain practical experience. As a result, the co-op student often has a better appreciation for how our business system operates than may be gained by other students, sometimes especially by those who receive on-campus financial aid.

Our minority co-op participation began in 1970, and has two special programs. One, less closely related to N.E.E.D. objectives but nevertheless relevant, admits a very limited number of students, currently only one each summer, into planned and committed summer work which we call our "Progressive Summer Employment Program." The students are science or mathematics majors selected competitively from the

predominantly black colleges that are in our immediate vicinity and that do not have formal co-op programs. The schools meet our objective for academic liaison by appointing a specific faculty member for that purpose. This program thus meets all of the "essential ingredients" that were previously listed for cooperative education, the "alternating sequences" in this case being academic years on campus and summers at work.

The other program, and the one most directly related to N.E.E.D. objectives, was also started in 1970 and is restricted to engineering students. Our program was inspired by the pioneering work of Dr. B. A. Turner of Texas Southern University,⁽¹⁾ and was developed in parallel with a very similar but larger one that has been described by W. C. Kuykendall of the Nuclear Division of Union Carbide Corporation.⁽²⁾ These two programs were initiated as a direct result of a conference in the summer of 1969 for representatives of the six predominantly black engineering schools arranged by W. W. Grigorieff, then of Oak Ridge Associated Universities.⁽³⁾ At this conference the faculty members were brought into communication with the cooperative education programs of Union Carbide at Oak Ridge and with ours at Savannah River, and those not previously familiar with the advantages of cooperative education were evidently well impressed. In response to a question about how to increase participation by blacks in the engineering profession, these educators indicated that their greatest student recruitment needs were encouragement to enroll in an engineering college program and financial backing through the freshman year. They indicated that their students who successfully completed the freshman year generally experienced low dropout rates thereafter through the balance of their BS degree programs.⁽⁴⁾

We initiated a trial program in the summer of 1970 involving the engineering schools at North Carolina A&T State University and Tuskegee Institute, the predominantly black engineering schools that were nearest to our location. The engineering curricula at both schools were already accredited by the Engineers Council for Professional Development. Following are the essentials of this trial

program, which was established to cover the five-year period from July 1970 through June 1975. These provisions are summarized in Figure 4.

1. We agreed to take three students from each school that summer of 1970 as "pre-co-op" employees.
2. These students would be selected from among students accepted for entry and referred to us by the colleges.
3. We expressed a desire to assist in recruiting students to apply to the colleges from our local area, and we asked the colleges to give special consideration to our local area in referring students to us.
4. We agreed to reimburse each college for freshman year tuition, fees and book charges for the number of students entering that 1970-71 year, with the intent of replacing a student on the same basis later if necessary.
5. We agreed to reimburse each college for the time and expenses of an administrator to provide liaison with its three students in this program, to provide whatever on-campus measures might be appropriate to meet these students' needs, and to develop the on-campus co-op programs to interact fully with ours on-site.
6. Upon satisfactorily completing the freshman year on campus and meeting the criteria for the schools' and our co-op programs, each student would be placed in the co-op programs and assured of a normal employment place with us as long as he or she maintained good standing.

The five-year contracts for this program with North Carolina A&T and Tuskegee will expire at the end of this month. We have been assured that the colleges and the students have benefited, and we consider the results gratifying in all respects. Figure 5 gives a brief summary of the status.

Of the six students who entered the program in 1970, all were from the local area. Five were 1970 high school graduates in the top 10% of their classes, and the other was an Air Force veteran whose military experience as a jet engine mechanic and flight engineer had convinced him that he should go to engineering college. The one girl in the group was the salutatorian of her high school class of 135.

In the absence of our program we believe that only the Air Force veteran intended to enter engineering school, and he would not have done so until a year or more later than he did. Two definitely would not have done so, and the other three might have had a 50% probability at best in the absence of our program.

The six have suffered zero academic attrition. Two mechanical engineering majors and one electrical engineering major graduated this spring right on schedule, and another mechanical engineering major expects to graduate in August. The other two EE majors will take a little longer, one expecting to finish in December and one a semester later.

Of the four mid-1975 graduates, two accepted permanent employment with us, one is employed elsewhere, and one plans to enter dental school. We of course realize that the ultimate results of this trial program must await the passage of several more years until the satisfaction of the six individuals with their engineering training in their careers can be fully determined, but we believe that good reasons exist for optimism.

Beginning with the summer of 1973, we felt sufficient confidence in the trial program to initiate a new one on a continuing basis but otherwise on almost identical principles. Under this new program we agreed with three minority engineering programs to take pre-co-op students each summer. The schools and the number from each are shown in Figure 6: One each from North Carolina A&T and Tuskegee; and two from the Atlanta University-Georgia Tech Dual Degree Program. These numbers are not large in themselves, but the total is a significant fraction of the openings that we have in our total co-op program each year. The apparent favoritism toward

the Atlanta University Dual Degree Program results from the fact that only this program offers the possibility for students to major in chemical engineering where most of our needs lie. I should pointedly add that the Atlanta University Dual Degree Program now also permits a participating student to receive a BS in Nuclear Engineering now that Georgia Tech has authorized this degree.

The only other differences from the 1970 trial program were that reimbursement to the colleges for liaison and follow-up was not included in the continuing program, and the nature of the Atlanta University Dual Degree Program requires that employment subsequent to the first summer be in the Progressive Summer Employment category of our co-op program. In this case, however, a student's normal BS degree schedule will give him or her five summers or over 15 months of on-the-job experience in our co-op program. I thus believe that one of our Atlanta University Dual Degree pre-co-op students who graduates will have fully met the ECPD guideline criteria for cooperative education. (5)

This continuing program has again been satisfying in the help it evidently has provided in assisting and encouraging minority students in engineering education. Figure 7 summarizes the current status. Even though the success rate has not been as high as among our 1970 entering students, the attrition rates have been no higher than those typical of engineering enrollments in general. Within the local area the program has continued to attract fine people, including the salutatorian of a 1973 high school class of 94 who went on to win the Tuskegee award for the highest academic average in the 1973-74 freshman engineering class. Small numbers have little significance, but we note with interest that neither of the two academic losses to date from the eight students entering in the summers of 1973 and 1974 have been among the four students from the local area, so that we have yet to lose an entering student whose residence is nearby. We shall probably never learn whether this results from local family and peer stimulation, from the relatively larger economic advantage of working at home, or from a quirk which later statistics may erase. But we feel fortunate in the good record to date,

and we are certain that at least some elements associated with our local black communities are now more keenly aware that competent and interested black high school graduates are welcome in engineering college programs, can obtain advice and assistance on engineering opportunities, and can succeed in engineering study and in embarking on engineering careers.

ACKNOWLEDGEMENT

The information in this paper was developed in the course of work under Contract AT(O7-2)-1 with the U.S. Energy Research and Development Administration.

REFERENCES

- (1) B. A. Turner, Report on Project-Minority Manpower Resources Study - September 1, 1965 - August 31, 1969. Texas Southern University, August 31, 1969.
- (2) W. C. Kuykendall, Minority Pre-Co-Op Program for High School Graduates. USAEC Report UCC-ND-246, May 1973. Union Carbide Corporation Nuclear Division, Oak Ridge, Tennessee.
- (3) Interim Report - ORAU. AEC Workshop for Traditionally Negro Institutions. Oak Ridge Associated Universities, Special Projects Office, September 8, 1969.
- (4) T. F. Hendon and C. H. Ice - Personal communication.
- (5) Engineers' Council for Professional Development, 41st Annual Report, 1972-73, page 48.

Figure 1

Principal Production Operations - Savannah River Plant

Figure 2

SUMMER TECHNICAL EMPLOYMENT - DU PONT AT SAVANNAH RIVER
FOUR YEAR AVERAGES - 1973-1975

	<u>TOTAL</u>	<u>BLACK*</u>	<u>ENGINEERING</u>	<u>BLACK ENGINEERING</u>
Faculty	14	4.5	4	1
Graduate Students	12	6	5	2.5
Undergraduate Students	18.5	7	8.5	1

* Includes faculty from predominantly black schools.

Figure 3

Savannah River Plant
Cooperative Education Program
May 1, 1975 Projected Status as of Summer, 1975

		<u>Total</u>	<u>Engineering Programs</u>
Schools Participating		15	14
Students Participating	Total	49	42
	Black	19	15
	Female	8	6

Figure 4

Provisions: Trial Pre-Co-Op Engineering Program
Du Pont at Savannah River 1970-75

Colleges - N.C. A&T, Tuskegee

Number of Students Provided For - 6

Colleges Provided: Referrals of Students Accepted for Entry
to Du Pont Liaison with Students

Co-op Liaison to Meet Du Pont Needs

Du Pont Provided: Recruiting Assistance in Local Area
to Colleges Pre-Co-op Appointments

Co-op Openings Upon Qualification

Freshman Year Tuition, Fee, Book Support

5-Year Support for Liaison

Figure 5

5/75 Status - Trial Pre-Co-op Engineering Program
Du Pont at Savannah River 1970-75

Students Entering in 1970:	6 - 3 N.C. A&T 3 Tuskegee
Number from Local Area:	All
Female:	1
Attrition Through 5/75:	None
Graduation - Past:	3 - spring 1975
Expected:	1 - summer 1975 1 - December 1975 1 - spring 1976
Majors:	3 - ME; 3 - EE

Figure 6

Annual New Student Commitments
Current Du Pont - Savannah River Pre-Co-op Engineering Program

North Carolina A&T State University	One each summer
Tuskegee Institute	One
Atlanta University Dual Degree Program with Georgia Tech	<u>Two</u>
Total	Four

Figure 7

5/75 Status - Current Pre-Co-Op Engineering Program
Du Pont - Savannah River Plant

Summer of Entry	<u>1973</u>	<u>1974</u>	<u>1975</u>
Students Entering	4	4	4
Number from Local Area	3	1	3
Female	1	1	0
Losses	1 withdrawal 5/74	1 suspension 5/75	-
Majors as of 5/75	ChE		2
	EE	1	2
	IE	1	1
	ME	2	1