Vol. 4, No. 3

NCINSIGHT

N.C. Center for Public Policy Research

The North Carolina Center is an independent research and educational institution formed to study state government policies and practices without partisan bias or political intent. Its purpose is to enrich the dialogue between private citizens and public officials, and its constituency is the people of this state. The Center's broad institutional goal is the stimulation of greater interest in public affairs and a better understanding of the profound impact state government has each day on everyone in North Carolina.

A non-profit, non-partisan organization, the Center was formed in 1977 by a diverse group of private citizens "for the purposes of gathering, analyzing and disseminating information concerning North Carolina's institutions of government." It is guided by a self-electing Board of Directors, and has some 600 individual and corporate members across the state. The Center's staff of associate directors, fellows, and interns includes various scholars, students, journalists, and professionals from around the state. Several advisory boards provide members of the staff with expert guidance in specific fields such as education, publications, and fund raising. The Center is forbidden by law from lobbying or otherwise attempting to influence directly the passage of legislation.

Center projects include the issuance of special reports on major policy questions; the publication of a periodic magazine called *N.C. Insight;* the production of forums, seminars, and television documentaries; the maintenance of a speakers bureau; and the regular participation of members of the staff and the board in public affairs programs around the state. An attempt is made in the various projects undertaken by the Center to synthesize the integrity of scholarly research with the readability of good journalism. Each Center publication represents an effort to amplify conflicting views on the subject under study and to reach conclusions based on a sound rationalization of these competing ideas. Whenever possible, Center publications advance recommendations for changes in governmental policies and practices that would seem, based on our research, to hold promise for the improvement of government service to the people of North Carolina.

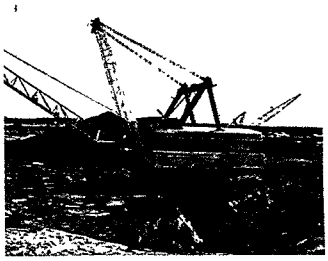
N.C. Insight
Editor: Bill Finger
Contributing Photographer: Paul Cooper

Design and Production: Joe Pfister, Ben Fewel, Katia Noin-Shaw, Southern Types, Durham, N.C.

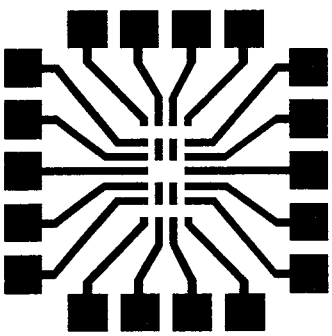
Cover by Paul Cooper

vol. 4 / no. 3

NCINSIGHT



MICROELECTRONICS



N.C. INSIGHT is a quarterly magazine published by the North Carolina Center for Public Policy Research, Inc. (a non-profit, tax-exempt corporation) at Room 412, 336 Fayetteville Street Mall, P. O. Box 430, Raleigh, N.C. 27602. Telephone (919)832–2839. Annual membership rates: Individual, $15; Library or non-profit group, $30; Corporation, $50. Third class postage paid at Raleigh, N.C. Printed by Theo Davis Sons, Inc., Zebulon, N.C. The Center is supported in part by grants from the Mary Reynolds Babcock Foundation and the Z. Smith Reynolds Foundation. The views expressed in this publication are those of the authors, and are not necessarily those of the Center's Board of Directors or staff. Published September 1981.

Photo courtesy of Eulada Watt, Teenage Parent Services

Pregnant Teenagers

Their Education is Suffering

by Susan M. Presti and Blanche Glimps

"The people have a right to the privilege of education, and it is the duty of the State to guard and maintain that right."

Article I, Section 15,
North Carolina Constitution

Ayana, a 15-year-old, is on the honor roll at her North Carolina high school. Like most tenth graders, she is interested in dances, records, and boys. Yet Ayana is different. In 1979, she became pregnant and decided to have and keep her baby.

Ayana stayed in school even though it was very hard for her. She was the brunt of teasing, and she was afraid of being injured when everyone rushed through the halls between classes. "I felt so different from everyone else in school," she remembers.

Fortunately, Ayana had access to a special school for pregnant girls in a North Carolina city. She attended that school during her pregnancy and the school quarter following her delivery. Back in her old school, she faces new difficulties as a student and a mother. "Friends treat me like a married woman," says Ayana. Her best friend's parents refuse to let the two girls see each other. Meanwhile, Ayana is having trouble keeping up her grades and is beginning to doubt she will be able to attend college.[1]

Pregnant adolescents must suddenly move from being a dependent to being a provider, a leap which carries with it enormous stress. Nationally, in 1979, 1.1 million teenagers became pregnant, and 554,000 – like Ayana – chose to have and keep their baby. The majority of teenage mothers never receive a high school diploma, and many end up at an unskilled job or on welfare. Nine percent of teenage mothers attempt suicide (seven times higher than other female adolescents), and teenage mothers abuse their children at a rate 100 times

---

Susan M. Presti is project director at the N.C. Center for Public Policy Research. Dr. Blanche Glimps, a fellow at the Bush Institute for Child and Family Policy, University of North Carolina at Chapel Hill, has recently completed a study of the pregnant teenager issue. N. C. Center intern Terry Wall contributed to the article.

higher than that of the general population.[2] The high dropout rate among pregnant teens and the consequences for the mother, the child, and society suggest, as psychologist Kristen Moore puts it, that "programs aimed at assisting young mothers to complete high school are a good investment for the government as well as the individual."[3]

Such programs can range from special counseling and instruction to utilizing community health resources for new parents. A flexible curriculum and homebound services around delivery time are important, as is the option of an alternative school with day care facilities. "These young girls need special instruction and counseling to learn methods of infant care, to understand child development and the importance of the mother-infant relationship," says Shirley Willis, director of the Durham Cooperative School for pregnant girls.[4]

Few dispute the idea that a pregnant student's physical, emotional, and educational needs are different from those of a nonpregnant student. Yet determining ways to meet those needs is another matter. In 1977, the General Assembly passed legislation, known as the Creech Bill,[5] which guarantees exceptional children access to special services they need in order to continue their education. Pregnant students were explicitly included in the definition of "children with special needs." Yet four years later, officials within the State Department of Public Instruction (DPI) still maintain that DPI does not have responsibility for insuring that pregnant students receive special services nor has the General Assembly appropriated any funds for this purpose.

At a time of fiscal austerity in government, the educational needs of pregnant teenagers are a low priority. In a period of intense scrutiny of intergovernmental relationships, adolescent mothers seem to be the victims of a reluctance by state administrators to provide guidance to local school districts on this issue. The fiscal crunch and the lack of leadership at the state level have resulted in thousands of North Carolina teenagers missing out on the lofty promise of Article I of the state Constitution, "the right to the privilege of education."

No clear data exist on the number of pregnancy-related dropouts in North Carolina. The DPI collects figures on the number of school dropouts in the state, but it does not break them down by race, sex, or reason for leaving school. Even so, it does seem clear that pregnancy is a major factor in a girl's decision to quit school. Indeed, until recently, many public schools in North Carolina routinely expelled girls when the school administrators discovered they were pregnant. A 1969 survey of selected districts indicated that most schools required pregnant girls to withdraw during some stage of their pregnancy.[6]

In 1970, DPI reported that 22,000 babies were born annually to teen mothers in the state and that pregnancy was responsible for a large number of the young mothers permanently terminating their education. In 1980, the Department of Human Resources reported 16,725 births to teen mothers in North Carolina. Then in 1981, the Legislative Research Commission on Public School Dropouts cited pregnancy, marriage, and lack of child care as important factors that increase the dropout rate.[7]

Since the 1970 DPI report, state officials and educational advocates have been working in various ways to address the needs of pregnant teenagers. The DPI report recognized "the need to create a humane and constructive concern for these school-age pregnant girls," and recommended that "an opportunity be provided to the school-age pregnant girls for further education."[8] In response to this report, on February 4, 1971, the State Board of Education approved a policy statement encouraging continued education for pregnant students and directing DPI, in conjunction with local educational agencies, to provide appropriate educational services for such students. Despite the State Board of Education's directive, however, DPI did little to address this issue.

In 1973, the North Carolina United Way convened a task force to examine the problem pregnancies. The group recommended that every pregnant girl be permitted to remain in her school of record or to attend an alternative school and that family life education curricula be developed for grades kindergarten-12 as a means of preventing problem pregnancies. Then in 1974, the General Assembly addressed the issue through the Equal Educational Opportunity Act, which recognized that "tremendous public interest exists to seek ways of more effectively rendering a beneficial service to all of our children, and especially those who have special needs."[9] The act included pregnancy in its definition of special needs; for the first time North Carolina law specifically protected the right of pregnant students to continue their education.

Meanwhile, national legislators were also addressing the rights of teenage mothers. In the Education Amendments of 1972, the U.S. Congress adopted Title IX, which prohibited any school that receives federal monies from discriminating on the basis of sex.[10] Title IX thus forbade discrimination on the basis of pregnancy or marriage. Then in 1975, Congress passed the Education for All Handicapped Children Act (PL 94-142), which established guidelines for guaranteeing educational services to exceptional

The DPI Rules *suggest that virtually all pregnant students are eligible for homebound services during the period surrounding their delivery.*

children and stipulated that, in order to receive federal monies for such services, states would have to follow these guidelines.

To comply with the new federal guidelines, in 1977 the General Assembly passed the Creech Bill, which guarantees all children with special needs between the ages of 5 and 18 the right to a "free appropriate publicly supported education." While the federal law which prompted the Creech Bill did not explicitly include pregnancy under the category of "special needs," the Creech Bill did:

> The term "children with special needs" includes, without limitation, all children between the ages of five and 18 who because of permanent or temporary mental, physical or emotional handicaps need special education, are unable to have all their needs met in a regular class without special education or related services, or are unable to be adequately educated in the public schools. It includes those who are mentally retarded, epileptic, learning disabled, cerebral palsied, seriously emotionally disturbed, orthopedically impaired, autistic, multiply handicapped, *pregnant*, hearing-impaired, speech-impaired, blind or visually impaired, genetically impaired, and gifted and talented. *(emphasis added)*[11]

The Creech Bill required special services for those persons who fall within the categories just named. Major provisions of the act required: 1) the State Board of Education to develop a plan for the implementation of the legislation; 2) local educational agencies (LEAs) to either offer special educational services for children with special needs or purchase such services from other agencies; 3) the LEAs to prepare annual individualized education programs (IEPs) for every child with special needs in the district; and 4) the DPI to monitor the effectiveness of the IEPs.[12]

The Division of Exceptional Children within the Department of Public Instruction is the state agency responsible for fulfilling the mandate of the Creech Bill. In its *Rules Governing Programs and Services for Children with Special Needs*, the Division identifies pregnant girls with special needs as those who, "because of their pregnancy, require special education and/or related services other than that which can be provided through regular education services."[13] The *Rules* go on to describe "a continuum of programs and services available to children with special needs," including hospital/home services for those expected to be confined for four weeks or more for treatment or convalescence. Homebound students are "to be given instructions based on their individual needs from three to five hours per week unless prohibited for medical reasons."

The DPI *Rules* suggest that virtually all pregnant students are eligible for homebound services during the period surrounding their delivery. But in 1980, according to the reports of school principals throughout the state, only 10 percent of those students who were pregnant received special educational services. The principals reported 4,417 pregnancies in their schools. Of that total, 462 students received special services.

Thousands of pregnant teenagers did not receive special services in 1980, apparently in violation of the guarantees of the Creech Bill and of the *Rules* issued by DPI in 1979. But Ted Drain, director of the DPI's Division of Exceptional Children, disagrees with such an interpretation. "A child must be handicapped as well as pregnant

in order to qualify for special services under the legislation," says Drain.

In 1980 the Attorney General's Office issued an opinion which contested Drain's interpretation. It concluded: "In summary, a local school system has the same legal responsibility to a pregnant student as to any other child defined by law as a child with special needs."[14]

Other legal experts on the issue agree with the Attorney General's ruling rather than with Drain's position. "To qualify as a special needs child, a pregnant student must be both pregnant and unable to receive an adequate education in regular class unassisted by special education services," explains Bonnie Davis, assistant director of the Institute of Government. "But those are the only conditions the student must meet under the law. It simply does not square with the plain language of the statute to limit the condition of pregnancy as a qualifying condition to students who possess another special needs condition."[15] According to Assistant to the Superintendent of Public Instruction Bill Peek, who helped draft the Creech Bill, the legislation guarantees that "to the degree the pregnant status has brought about needs, the pregnant girl should be receiving services."

Such opinions, though, have done little to change the posture of the Division of Exceptional Children. Barbara Conner, information specialist for the Division, states flatly, "I don't have anything to do with pregnant girls .... [They] do not fall within the Division of Exceptional Children. They are not part of our jurisdiction. I don't understand the reasoning [for including them in the Creech Bill]."

The Division's interpretation seems to be dictated by monetary issues. Because pregnancy is not included under the federal special education legislation (PL 94-142), no federal monies are available to school districts for the provision of special services to these students. And despite the passage of the Creech Bill, the General Assembly has never appropriated monies specifically for this purpose. Rather, the legislature appropriates a lump sum for special educational services. The Division of Exceptional Children "hasn't got enough money to take care of all the other children with special needs," says Dr. Minta Saunders, former assistant secretary for children in the Department of Human Resources, who has been involved in interagency efforts to coordinate health and educational services to pregnant girls.

In a needs assessment for the 1981-1983 biennium, the Division determined that an additional $32 million would be required merely to provide services to the handicapped students it was then assisting. In its 1981-1983 expansion budget, DPI requested an extra $31 million for the Division, but the Advisory Budget Commission rejected the request. In its appropriations bill for 1981-1983,[16] the General Assembly did not increase the Division's budget (in real terms) from the previous biennium. If the Division expanded its special services clientele to include pregnant girls, it would further attenuate scant resources.

Since the state is not providing any funds to the schools specifically to serve the pregnant population, DPI "must be sure it doesn't usurp the prerogatives of the local schools," says Dudley Flood, director of Student Services within DPI. In other words, since it targets no money to local school systems for services to pregnant girls, the Department cannot make demands upon the localities to provide specific services to pregnant students. Hence, it is up to the localities to provide such services as they can – homebound services, extended day, special programs, and separate or alternative school programs.[17] Consequently, the availabil-

In 1980, only 10 percent of those students who were pregnant received special educational services.

ity of these options varies from district to district. (See box for a description of two programs.)

The unevenness of these services at the local level has led many groups, including the Governor's Advocacy Council on Children and Youth, to press DPI to clarify its position on services for pregnant students and to provide more guidance to local school districts as to what their obligations are under the law. Bill Peek admits that the different interpretations of the Creech Bill may be sending mixed signals to the local education agencies (LEAs). "Our office may need to clarify the vibes that are going out on exceptional children," he says. "Further conversation needs to take place with regards to needs, who can provide them, and in what setting."

Local school administrators seem to agree with Peek's assessment. In a 1981 survey, 59 percent of the state's local school administrators indicated that they would like to have state guidelines available to assist the local schools in developing services for pregnant students; 44 percent indicated there were no written policy guidelines from their local school boards for providing services to pregnant teens.[18]

Despite the lack of clear guidance from either state or local authorities, there have been some efforts to improve the coordination of services to pregnant teens. The most notable effort has been by the Department of Human Resources (DHR), which has a vested interest in services for pregnant girls since county health departments frequently provide pre- and postnatal care to pregnant teens. In 1980, DHR and DPI issued a "memorandum of

Alternative Schools

Photo courtesy of Eulada Watt, Teenage Parent Services

"Career Day" at Teenage Parent Services (TAPS), a school for pregnant girls in Charlotte.

Some school districts in the state have developed alternate school programs to better meet the needs of pregnant students. A school for pregnant girls, for example, exists within the Charlotte-Mecklenburg school system. The Greenville city school system operates a school for students with varying special needs, including pregnancy.

Teenage Parent Services (TAPS) has been operating since 1970 in Mecklenburg County. The county Department of Social Services and Board of Education coordinate the program, which is open to any pregnant student enrolled in the Charlotte-Mecklenburg school system. During the 1979-1980 school year, 419 students participated in the program. Usually, guidance counselors refer pregnant students to the TAPS program. Students who decide to enter the program remain in their home school until the end of the school quarter. They enter TAPS at the beginning of the new quarter and can remain there until the end of the quarter following the birth of their child.

The TAPS staff includes teachers, counselors, social workers, a psychologist, a media specialist, and a public health nurse, and its program offers a varied curriculum and multiple services. Along with basic academic and elective subjects (history, math, business, home economics, etc.), students can participate in workshops designed to meet the needs of pregnant girls. Workshop topics include anatomy and reproduction, sexuality, prenatal care, child care, reality counseling, and values clarification. Social workers and teachers make home visits together to talk with the students' families. The program also offers assistance in finding transportation to doctors' offices, securing child care, and filling out applications for voter registration and financial aid programs. In addition, all students receive a nutritious breakfast and lunch free of charge or at reduced cost.

TAPS conducts special activities throughout the year. A "Career Day" is held during which former TAPS students who have pursued advanced training return and share their professional experiences. Holidays and special events at the school provide an opportunity for families and boyfriends or husbands to interact with

agreement concerning the provision of services to pregnant school age girls/school age parents for the purpose of reducing infant deaths and improving infant health." In the memorandum, the agencies agreed to promote "local referral processes to ensure that all school age pregnant girls have access to continuing education and/or vocational training in addition to the necessary health and social services necessary to achieve the birth of healthy infants."

The memorandum, which was distributed to all local health departments and LEAs, outlines suggested measures for pursuing these goals, but according to Dr. Jimmie Rhyne, who heads DHR's Maternal and Child Health Branch, "It's up to the localities to try to implement the memo as best they can." Consequently, the services available to a pregnant girl vary, depending upon where she lives in North Carolina. "In the larger urban areas, where there are quite a number of good programs in place, services are being utilized," says a DHR official. "But in the more rural areas, where there are fewer services regardless of what your problem is, there are fewer services for pregnant teens. Where you live in North Carolina makes a difference in terms of the services you get."

To address the unevenness of services throughout the state, some officials feel that the current law should be modified. Drain, the director of the Division of Exceptional Children, cites two reasons for eliminating pregnancy from the state's special education legislation and passing new legislation which would put pregnancy in a category

TAPS students and staff. A student newspaper, produced monthly, chronicles the events of the TAPS program.

Students strongly support TAPS. "The teachers are really concerned about you," commented one student. "They go along with the decisions you are trying to make, and help you with the goal you set for your life." Another said, "If you really don't know much about a baby, they teach you a lot." If TAPS were not available, the students feel that a similar program would have to be constructed in each high school within the city.

Students voice equally strong support for the Agnes Fullilove Community School (AFCS) in Greenville. "I like the program here – it helps you out as you help yourself," said one student. AFCS is an alternate school for a number of student subpopulations: pregnant girls, parents, employed persons, dropouts – "anybody who wants a high school diploma and doesn't want to be in the traditional high school," says Ann Harrison, director of exceptional children and pupil personnel for the Greenville City Schools. The AFCS Prenatal-Child Development program for pregnant girls offers free on-site day care facilities for students and staff. The nursery serves about five infants up to two years of age. Jane Poe-Eure, coordinator of the Prenatal-Child Development Program explains why the day-care service started: "We had girls who'd come to school every single day when they were pregnant, and after they had their babies, they dropped out. The real problem was after the pregnancy, not during." Martha McNair, who for the past two years has supervised the nursery on a salary provided by the county Council on Aging, says, "The nursery is really needed because some of these girls couldn't go to school without it. They can't afford baby-sitters." The nursery doubles as a "child development laboratory" where the students learn basic infant care.

Pregnant students must remain in AFCS until the time of their delivery and are then allowed up to four weeks at home before returning. (Returning is optional, though the AFSC staff encourages teen mothers to continue their education.) During their time at home, they receive coursework geared towards adjustment to parenthood, combining such subjects as reading, biology, and consumer-oriented problems.

The AFCS staff also tries to provide vocational counseling and help identify job opportunities for students. Each senior must set specific goals for post-high school work. The staff aids students in filling out applications and practicing interviews, and also provides job counseling. Many graduates find steady jobs and "a lot of these girls go on to Pitt Community College," says Poe-Eure.

The AFCS program has demonstrated considerable success. In a follow-up study of 35 pregnant girls in the program, an East Carolina University graduate student found that 91 percent said the program helped them as a parent; 82 percent either graduated or were still continuing their education (and 45 percent indicated they would have dropped out if they had not had the option of AFCS); and only 8 percent had had a second child.* One graduate of the program says simply, "There are better chances over here." Another adds, "Most students would rather be here than in public schools." □

*Pamela D. Wilson, "Follow-up of 35 Pregnant School Girls Who Were Enrolled in the Prenatal-Child Development Program at Agnes Fullilove Community School," 1980 (unpublished).

separate from special education issues. First, it's not part of the federal law; second, he says that local school units have complained that individualized education programs (IEPs), nondiscriminatory assessments, and due process hearings (all guaranteed under the Creech Bill) are superfluous for pregnant students.

During the 1981 legislative session, Drain and others suggested the change described above, but it never crystallized into proposed legislation because of legislators' negative reactions to the idea of reconsidering the Creech Bill. Some legislators feared that in the current political atmosphere opening the Creech Bill to amendment would jeopardize special educational services to all handicapped students because various special interest groups would lobby to eliminate or include any number of groups.

As long as legislation was passed protecting the rights of pregnant students, eliminating pregnancy from the Creech Bill would not damage a pregnant girl's educational opportunities. In fact, new legislation – if it specified the services that should be provided for pregnant girls – might help such students by clarifying the services LEAs are required to provide to them. But some legislation guaranteeing their right to an education is essential. "Some principals would still throw out pregnant students if they could," says a DPI official.

Pregnant girls need special counseling, a flexible curriculum, homebound services around the time of their delivery, and the option of an extended day or alternative school program so they can continue their education while they are raising their child. But such services are not available to all pregnant students in North Carolina.

In the absence of any modification of the Creech Bill, the state needs to clarify its policy on services to pregnant students. "The commitment [in DPI] to do something for pregnant girls has been nebulous at best," says Student Services Director Flood. Unless DPI provides the LEAs with guidelines for protecting the rights of pregnant students through appropriate services, educational opportunities for these girls will remain limited, and North Carolina will continue to have large numbers of pregnant girls who will never complete their high school education.

Most pregnant teenagers in the state are not as fortunate as Ayana, who had a baby at age 15 and is struggling to finish high school. Having the special services available during her pregnancy and immediately after the delivery helped her to get her feet on the ground.

"My baby is here now and I love her," says Ayana. "Yet, I know I am much too young to be a mother. I would tell all young girls and boys not to get too involved with each other. If the feelings you have for each other are true, they will be there when you both are older and can handle the consequences."

For thousands of teenagers, the kind of advice that Ayana offers will come too late. But that doesn't mean the right to an education has to be lost. Indeed, the wisdom and counsel of the framers of the Constitution must not be forgotten: "It is the duty of the State to guard and maintain that right." □

FOOTNOTES:

[1]In 1980-1981, Dr. Blanche Glimps conducted a survey of pregnant teenagers and school administrators to determine the success of current policies and the need for new initiatives. The study was under the auspices of the Bush Institute for Child and Family Policy at the University of North Carolina at Chapel Hill. Ayana (not her real name) was one of the students interviewed.

[2]Studies cited in *Teenage Pregnancy in North Carolina: Better Choices for a Better Future*, Governor's Advocacy Council on Children and Youth, June 1980, p. 3.

[3]Kristen Moore, et.al., "Teenage Childbearing: Consequences for Women, Families, and Government Welfare Expenditures," unpublished paper presented at the 87th annual convention of the American Psychological Association, Sept. 1-5, 1979, New York.

[4]Shirley Willis, "The 'When' and the 'Why' of the Cooperative School for Teenage Pregnant Girls," a history of the Durham school for pregnant girls, 1975, p. 5.

[5] Chapter 927 of the 1977 Session Laws.

[6]Survey of 37 North Carolina local educational agencies on policies relating to pregnant girls, conducted by the Charlotte-Mecklenburg Schools.

[7] Report to the 1981 General Assembly of North Carolina from the Legislative Research Commission on Public School Dropouts.

[8]Catherine C. Cooke, "Pregnant School Girls in North Carolina: A Problem for Education," N.C. Department of Public Instruction, 1970, p. 11.

[9]Chapter 1293 of the 1973 Session Laws, 2nd Session.

[10]P.L. 92-318.

[11]G.S. 115C-109 (as recodified in Chapter 423 of the 1981 Session Laws).

[12]By 1980, according to the National Association of State Boards of Education, at least 15 states in addition to North Carolina guaranteed services to pregnant students through special education legislation.

[13]16 NCAC 2E .1501-.1540

[14]Opinion written by Kaye Webb, Assistant Attorney General, September 30, 1980.

[15] Letter from Bonnie Davis to Blanche Glimps, November 13, 1980.

[16]Chapter 859 of the 1981 Session Laws.

[17] Twenty percent of the female population in extended day programs is pregnant, according to Nurham Warwick, coordinator of education and work, Department of Public Instruction.

[18]Conducted as part of the survey described in footnote one.

Meeting the Needs of Pregnant Students and Teenage Parents

Below are five recommendations for the Department of Public Instruction which might help provide a more supportive educational environment for pregnant students and teenage parents in North Carolina.

1. Appoint a person to coordinate programs for pregnant students and school age parents and for interagency matters related to such programs.
2. Through the State Board of Education, develop a policy statement that encourages local boards of education to develop a systematic method of serving pregnant students and teenage parents in their districts.
3. Through the Division of Exceptional Children, revise its *Rules Governing Programs and Services for Children with Special Needs* to clarify how pregnant students are eligible to receive services for exceptional children.
4. Develop and implement procedures for determining the extent of pregnancy related dropouts within the state.
5. Solicit private and public funding to provide LEAs with money to support their efforts to develop programs for pregnant students and teenage parents.

Periodically, the Department of Public Instruction prepares official plans to address issues for which the Department has responsibility. It has not prepared a formal plan on the needs of pregnant students and teenage parents. Below is an outline of a plan which could be used to implement the recommendations listed above.

I. **Position Statement**

Pregnant students and teenage parents are a group with special needs. The State is concerned with providing an educational environment which addresses their needs. An educational environment for pregnant students and teenage parents should be conducive to the continual growth of these individuals.

II. **Program Goals and Implementation Plan**

A. Goal: To decrease the incidence of school dropouts among pregnant students and teenage parents.

Plan: Make regular school and homebound services available to all pregnant students. Provide extended day, special schools, and special programs where possible, using local resources.

B. Goal: To assist the student with understanding parenthood through courses on the subjects of pregnancy and childbirth, child development, and infant care.

Plan: Courses on child development, consumerism, sexuality, and decision-making should be available throughout the student's educational career.

C. Goal: To utilize and coordinate existing local resources and to provide personal, academic, and vocational counseling to assist the students in assessing their present and future life directions.

Plan: The "Memorandum of Agreement" issued in 1980 by the Departments of Human Resources and Public Instruction should be fully implemented with regards to health, social, educational, and local referral processes. (See article for a full explanation of this memorandum.)

D. Goal: To prevent the cycle of premature parenthood among school age students.

Plan: Local school districts introduce and/or expand an effective health education curriculum.*

III. **Program Evaluation**

The Principal's Annual Report form should be modified to include:

A. Number of pregnant students in the school.
B. Number of pregnant students receiving homebound services.
C. Number of students referred to alternate school programs (including extended day).
D. Number of pregnant students receiving other special educational services provided by the school.
E. Number of pregnant students who dropped out of school.
F. Number of students reentering school after having dropped out (in previous years) due to pregnancy.

*State law mandates such a program, but adequate funds have not been appropriated to meet the law's requirements (G.S. 115C-81[e], the 1978 "Act to Establish a Statewide School Health Education Program Over a Ten-Year Period of Time," as recodified in Chapter 423 of the 1981 Session Laws).

Dateline Raleigh

Coping with a Fiscal Revolution

by Ferrel Guillory

One man in particular is responsible for the reconvening of the North Carolina General Assembly this fall – the President of the United States. Legislators will meet to adapt state government to Ronald Reagan's fiscal "revolution." Had Jimmy Carter been re-elected president in 1980, it is unlikely that state lawmakers would find themselves holding such a second session this year – an extraordinary exercise in adapting the state lawmaking process to changes in the federal government.

Not until October 1, the start of the federal fiscal year, will the American people and their state and local officials begin to feel the actual effects of the Reagan budget as approved by Congress. The fall session of the N.C. Legislature – to begin in October – serves as one of the first tests of how a state will react to the $35 billion in domestic spending cuts and to a new system of "block" grants that allow state and local governments to set priorities for themselves.

Under a block grant, federal aid is sent to a state not for a specific program but in a lump sum to be spent as state officials decide. The Reagan program, as approved by Congress, provides block grants for preventive health services; maternal and child health; primary care; alcohol abuse, drug abuse and mental health; education; community services; community development; energy assistance; and social services. Within these broad categories, North Carolina officials can use the federal money however they choose. State officials can keep existing programs, reduce them, or start up programs of their own. Once a program is put into a block grant, previous federal rules imposed on a state do not apply. Thus, through the fiscal process of block grants Reagan is moving toward rewriting much federal domestic policy.

Anticipation of Reagan-inspired cuts in federal aid to state government cast a shadow over the regular 1981 legislative session. The legislature reduced the state budget by about $20 million in each year of the 1981-83 biennium and deferred or eliminated expansion budget items totaling $141 million in 1981-82 and $184 million in 1982-83. Moreover, the legislature decided to convene again in the fall to readjust the biennial budget bill after the extent of the Reagan cuts had become clear.

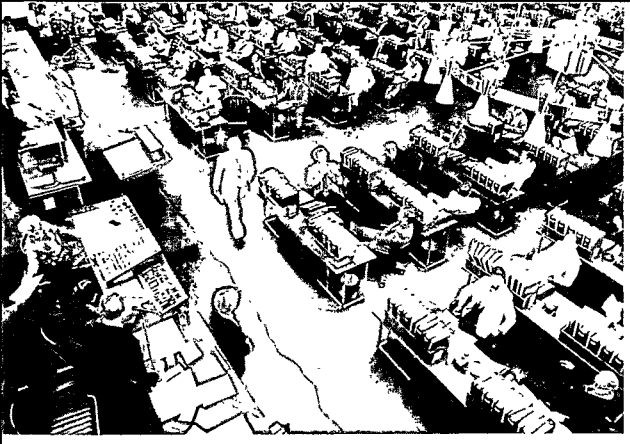
Federal funds constitute about one-fourth of North Carolina's $11.7 billion biennial budget. On the basis of Reagan's original proposals, officials estimated the state's loss of federal revenue to be about $300 million. Because of changes made by Congress to Reagan's proposals, however, it now appears that North Carolina will lose $150-200 million. Moreover, Congress did not fold as many individual programs into block grants as Reagan had sought.

Still, state officials do not believe that there is enough state revenue available to pick up all of the federal cuts. With the legislature having just raised the gasoline tax in the spring and with additional measures still pending in the fall to bolster the Highway Fund, the prospect of legislators raising more taxes to offset federal cutbacks is virtually nil.

Governor Hunt has accepted the National Governors' Association calculation that state governments could absorb a 10 percent reduction in federal aid if given increased administrative flexibility. But the cuts have gone well beyond 10 percent and for those programs grouped into block grants approach 25 percent. In a speech to a gathering of human resources agency officials from around the country, Hunt expressed the dilemma

---

Since 1972, Ferrel Guillory has been a political reporter for the Raleigh News and Observer, *as the chief capitol correspondent and head of the Washington Bureau. Now associate editor, he is responsible for the editorial page.*



The North Carolina House of Representatives.

of a governor who supports heightened state responsibility – a rejuvenated federalism – but who faces substantial cuts in federal funds.

"As I see it, what we've worked for so long [federalism] could turn out to be a real disaster," said Hunt. "As great as the opportunity is, the disaster could be equally great, not because it's a bad concept, but because the cuts are so deep and because we have so little time to adjust to them . . . . Make no mistake about it, cuts of that magnitude mean that not some, but many of the people who are receiving help this year will not receive help next year. There is going to be real pain and real suffering."

When the hurt begins, who is to get the blame? To date, Reagan has gained politically for his instigation of deep budget-cutting in social programs. Revising the state budget to take these cuts into account, the Governor, legislators, and other state officials will be put in the position of bearing bad news to recipients of curtailed government services. "It sounds big, these block grants," said House Speaker Liston B. Ramsey. "But the bottom line is that we'll have 25 percent less money and be expected to do with 75 cents what we used to do with one dollar. We can't do it that way. Those that get hurt – I hope they don't blame the state government."

Legislators, bureaucrats, and advocates of specific programs have a natural bias toward preserving existing programs even at reduced levels of financing. After all, the thinking goes, it is preferable to keep a program and wait for better times than to kill it completely and try to resurrect it later. As described by state officials, one of the basic choices awaiting legislators in the fall session is whether to cut programs proportionately or whether to scrap a particular program in order to save or start another one.

Much of the lobbying and political competition for budget funds that used to take place in Washington will now be shifted to state capitals. In Raleigh, legislators and the Governor will come into the fall session with their own agendas. For example, Ramsey said he wanted the state to pick up about $42 million that was cut out of the school lunch program. At the same time, state employees are seeking a pay raise, which would cost about $106 million; the General Assembly and the Governor have declared these salary increases to be a top priority.

In preparation for the fall session, Governor Hunt plans to put together his own package of recommendations of how to respond to the federal budget-cutting. He has authorized an *ad hoc* interagency task force to examine block grants and to develop policies for state action. The administration's budget priorities, in addition to a pay raise for state employees, will probably emphasize education programs such as day care and reducing the size of public school classes. Betty Owen, the gubernatorial assistant for education, is the task force coordinator. Other participants include gubernatorial aides Paul Essex and Robert Jansen and representatives of the state budget office, the Department of Human Resources, the Department of Public Instruction, and the Department of Natural Resources and Community Development.

Meanwhile, in the Department of Human Resources, officials have held meetings with medical care providers to discuss Medicaid, a federal program which could be severely affected by budget cuts. Of the $503 million spent for Medicaid in North Carolina in 1980, the federal share was about $333 million, but that share will be cut about three percent in 1981-82 and four percent in 1982-83. Human Resources officials are trying to determine if dentists, pharmacists, physicians, hospital representatives, and other providers could find ways to cut down on reimbursements – for example, by doing some medical procedures on an out-patient basis rather than requiring hospitalization. If federal cuts cannot be absorbed by such techniques, the legislature may be faced with deciding whether to raise the state share of the Medicaid budget, to accept reduced services under this program, or to limit the number of beneficiaries. The issue of Medicaid, which provides health care to the poor, may well be one of the toughest problems confronting state government in connection with federal budget-cutting.

The legislature's impending encounter with budget cuts and block grants may not be its last. President Reagan has promised to try to expand the block grant approach to federal-state relationships and his tax cuts combined with higher defense spending foretell deeper domestic program reductions. Unless the Reagan "revolution" is quashed, the North Carolina General Assembly may find its agenda dominated for several years by that particular man in Washington. □

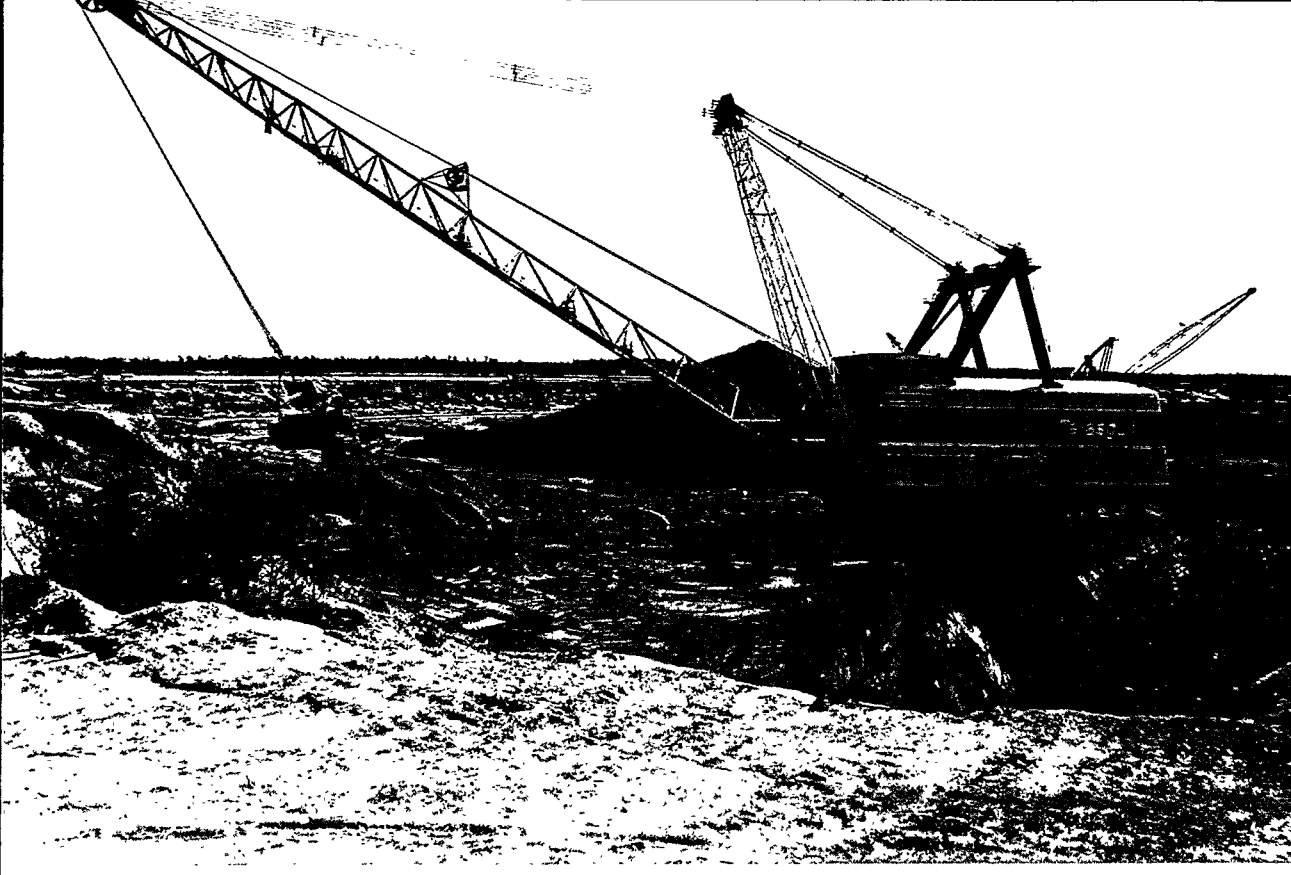


Photo taken by Jerry Hughes, courtesy of Texasgulf, Inc.

Balancing budgets and politics with the environment

Severance Tax or Depletion Allowance Repeal?

by Bruce Siceloff

Large draglines mine phosphate at the Texasgulf Lee Creek Mine, Aurora, N.C.

This fall the General Assembly will consider a severance tax proposal that was introduced a day before the legislators adjourned for the summer on July 10.* If enacted, North Carolina will become the 31st state to assess a levy on nonrenewable resources taken from its land. But mining interests and some legislators have lobbied against the idea since its first airing in April, and Gov. James B. Hunt Jr.'s moderate enthusiasm for a severance tax appeared during the summer recess to be shifting toward an alternative proposal that was introduced in the legislature the same day: a bill to repeal the state income tax depletion allowance for oil, gas, and mineral royalties.**

The Hunt administration is seeking substantial new revenues to strengthen the inflation-struck Highway Fund. A severance tax in North Carolina would not be the bonanza it is in petroleum-rich states such as Alaska, Louisiana, and Texas. But a

Bruce Siceloff has been a staff writer for the Raleigh News and Observer *since 1976.*

*HB 1383, "North Carolina Severance Tax Act"
**HB 1382, "Eliminate Depletion Allowances"

Until a major phosphate deposit was discovered in the 1960s, officials did not consider this a mining state.

tax on two Tar Heel commodities – peat and phosphate – would produce substantial returns in the years to come.

"Basically, the Governor wants revenue for the 'Good Roads' package, and he wants it levied fairly and against people who can afford to pay," said John A. Williams, Hunt's budget officer and executive assistant. "It's a matter of how we can get the revenue and where does this burden fall."

The proposed four percent severance tax on the gross value of all solid minerals would have generated $14.4 million in revenues if applied to the $360,893,000 in minerals produced in the state in 1980. That revenue figure would probably grow rapidly in the coming years, thanks to the state's burgeoning phosphate industry and to the booming prospects for eastern North Carolina peat, soon to be mined for both methane conversion and electricity generation. Administration officials estimate that removing the depletion allowance would bring the state about $11 million in additional tax revenues annually. That figure, too, would increase, but not as rapidly as the severance tax return.

The oil, gas, and mineral depletion allowance – also a feature of federal tax laws – is the frequent target of tax reformers in Congress, but it has not been an issue in the General Assembly for 60 years since the depletion allowance was enacted as part of state tax laws. The theory behind granting a depletion allowance is the opposite of that behind levying a severance tax. One compensates producers for the gradual depletion of their resources and encourages them to find and produce more, while the other taxes producers for the privilege of severing what usually are nonrenewable resources from the land of a state.

Theory aside, the depletion allowance acts as a device by which oil, gas, and mineral producers – and all those with an interest in their wells and mines – are exempt from paying the full tax that is standard for most corporations. When Congress established the allowance in the federal tax laws in 1926, it allowed oil and gas producers to subtract 27½ percent of the gross incomes of their wells before computing their taxable income. In 1969 Congress trimmed that figure to 22 percent, by which time the concept had been extended to other minerals, all at different rates. In 1975 Congress made the major oil firms ineligible for the oil allowance and voted to phase down gradually the rate allowed independent oil producers until it reaches 15 percent in 1983.

Any corporation that extracts oil, gas, or minerals anywhere in the world and sells part of it in North Carolina pays state income taxes – and, if eligible for the federal depletion allowance, receives a state depletion allowance – on that part sold in this state. North Carolina tax laws permit such corporations to claim the depletion allowance rates set by Congress for federal income taxes. The removal of the state depletion allowance would in effect increase North Carolina's share in the profits of wells and mines around the world since the extra corporate income taxes paid would come from the profits of corporations based, in many cases, outside North Carolina. A severance tax, in contrast, would draw revenues only from mining interests within the state.

Until a major phosphate deposit was discovered in the 1960s in eastern North Carolina, officials did not consider this a mining state. Consequently, policymakers had paid little attention to the strengths and weaknesses of various mining taxes. The volume of sand, gravel, stone, and other minerals had been too modest to warrant a legislative fight over a severance tax, for example. During the 1970s, phosphate mining increased in importance but still the severance tax never became a legislative issue. Not until the fiscal crunch in 1981 due to a depleted Highway Fund and federal budget cuts, did the severance tax become a serious possibility.

In an April editorial, the *News and Observer* of Raleigh noted that North Carolina was one of the few states without a tax on mineral extraction. Still not geared to thinking about mining as a revenue source, state officials developing the

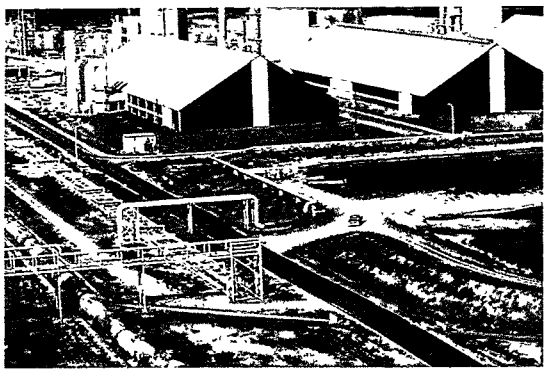


Photo taken by Jerry Hughes, courtesy of Texasgulf, Inc.

The fertilizer material plants at Lee Creek manufacture Diammonium phosphate and Granular triple superphosphate.

highway revenue package said that they had not seriously considered a severance tax before the *News and Observer* raised the issue. Noncommittal toward the tax at first, Hunt later said a modest severance tax would be included in the revenue package. But throughout the session, the Hunt forces seemed to be preoccupied with the motor fuels, alcohol, and other tax proposals, which involved far more money than did the severance tax proposal.

Because it was introduced as legislators were packing their bags to leave Raleigh, the severance tax proposal has not yet been debated publicly. Even the lobbying against it was said to be restrained before the details were laid out in the bill, and the depletion allowance repeal alternative was introduced without any advance mention from Hunt. In the rush of business during the legislative session, little attention seems to have been given to examining mining tax options. Consequently, the lawmakers may well approach the choice between a severance tax or repeal of the depletion allowance only from a fiscal and political point of view.

But other considerations demand examination – from the environmental impact of peat mining to the claims of industrial spokesmen that a severance tax would make them non-competitive. When the alternative proposals are debated this fall, members of the General Assembly should consider not only fiscal questions but also environmental and moral implications of taxing – or failing to tax – the depletion of the state's natural resources.

How a Severance Tax Would Affect North Carolina

Severance taxes have been around since the state of Michigan imposed a mineral levy in 1846. Revenues from severance taxes are used for a variety of purposes around the nation. In Montana, North Dakota, Utah and Wyoming, for example, a share of the coal severance tax is channeled to communities where mines are under construction but are not generating tax revenues to fund the expanded public services they require. Many states earmark part of the revenues for mine reclamation. Such is the case with Florida, which has a 10 percent tax on phosphate. (Florida now leads the nation in phosphate production but is expected to fall behind North Carolina before the end of the century.) These and similar uses for the revenues in other states reflect the philosophy behind a severance tax: The removal of a state's nonrenewable resources is a privilege for the miner and a deprivation to the state, which should be compensated.

Some groups, such as the congressional Northeast-Midwest Coalition, warn that a substantial severance tax by states rich in coal and oil hurts energy-poor states, where consumers must pay increased costs that companies charge as a result of the severance tax. In July 1981, The U.S. Supreme Court ruled against a challenge to Montana's 30 percent tax on coal, finding that a state has a right to levy substantial severance taxes.* This complaint would not be applicable to North Carolina, however, since the state does not have mineral deposits of the magnitude of a state like Montana and the proposed rate is four rather than Montana's 30 percent.

There are 30 states with oil, gas, or mineral severance taxes that generated more than $4 billion in state revenues last year. If you expand the group to include severance taxes on timber, a renewable resource, the number climbs to 33. (One of this number, the Commonwealth of Virginia, goes a step further with severance taxes on both timber and oysters.)

North Carolina belongs to this larger group, with a modest timber severance tax. The "forest products assessment" is not known widely even in the N.C. Department of Revenue, which collects it but forgets to mention it in the 14-page description of state and local taxes it updates each year for out-of-state businesses. In 1980, the tax brought a modest $1.29 million, all of it funneled to the N.C. Forest Service's Forest Development Fund, which helps landowners pay for reforesting cut timberland. The General Assembly levied the tax in 1977 and applied it to all timber harvested in the state except Christmas trees, home firewood and wood used for construction on one's own property.

North Carolina also has on its tax books a kind of severance tax on oil and gas, a levy to pay for

**Commonwealth Edison Co. v. Montana* 49 U.S.L.W. 5957 (1981).

the administration and enforcement of oil and gas conservation laws. In 1945, exploratory drilling in the state prompted the General Assembly to set up a skeleton oil and gas conservation statute – in case anyone struck paydirt – and to provide a modest tax to fund it (five mills per barrel of oil, one-half mill per 1,000 cubic feet of natural gas). But no oil or gas has ever been extracted from North Carolina wells. Consequently, North Carolina and Georgia – which has a similar statute – are the only states in the nation with a severance tax that produces no revenue.

Until recently, the state's most valuable mining commodity was crushed stone. Stone, sand, and gravel production totaled $159 million in 1979, a figure that dipped to $149 million in 1980 due to its dependence on the sagging construction industry. But in the mid-1960s, a vast lode of phosphate rock was discovered in Beaufort County on the coast, a find that has changed the nature of the state's mineral wealth. In 1980, that deposit yielded Texasgulf Chemicals Company of Raleigh 4.3 million tons of phosphate worth $107.5 million at the $25-per-ton price common at the beginning of 1981. The only firm now mining phosphate in the state, Texasgulf has built an industrial complex at Aurora, a Beaufort County community. But N.C. Phosphate Corporation is now building a mine near the Texasgulf facility that is expected to enter production on a comparable scale in 1983.

Since starting production 15 years ago, Texasgulf has steadily increased its phosphate output to meet an increasing worldwide demand and now plans to mine at least 6 million tons per year by 1984. Its 50,000-acre North Carolina holdings contain some 2.2 billion tons of ore that will last a century, even if current production levels are quadrupled. While unrefined phosphate rock sells for about $25 a ton, much of Texasgulf's ore is processed at Aurora into several fertilizer products. Diammonium phosphate, a major product of the Texasgulf Aurora complex, sells for more than $215 a ton.

Virtually all of Texasgulf's competitors are Florida phosphate producers which pay a ten percent tax on the gross value of phosphate at the time it is removed from the earth. Even though the North Carolina proposal calls for only a four percent gross value tax, Texasgulf officials still say it would be an unfair levy that would make it difficult for them to compete. "The best way to tax a corporation is on its profits," Lucius W. Pullen, Texasgulf vice president for law and communications, said when the severance tax idea was broached in April. "The severance tax could retard growth."

But some commentators in the state feel the severance tax could be an asset, not a liability. "The state collects nothing for commercial depletion of its natural resources," *The News and Observer* wrote in a June 30 editorial. "(Phosphate) has a healthy severance tax potential." And phosphate is no longer the only such mineral in the state.

North Carolina's peat reserves – hundreds of millions of tons in 1.2 million acres of Coastal

Severance Taxes in the United States

State	Oil	Gas	Coal	Metals	Nonmetals Minerals	Other	Amount (1979) (in thousands of dollars)
AL	x	x	x	x	x	x	$ 22,281
AK	x	x				x	173,685
AR	x	x	x	x	x		12,502
CA	x[1]	x[1]					48,093
CO	x	x	x	x	x		19,803
FL	x	x		x	x		91,902
GA	x[1]	x[1]					–
ID	x	x		x	x		552
IN	x	x					673
KS	x	x					1,097
KY	x			x			154,017
LA	x	x	x	x	x		511,589
MI	x	x					13,724
MN				x			71,263
MS	x	x			x	x	32,922
MO						x	45
MT	x	x	x	x	x		53,919
NE	x	x					1,516
NV	x[1]	x[1]		x	x		54
NH	x						207
NM	x	x	x	x	x		159,431
NC	x[1]	x[1]				x	1,013
ND	x	x	x				25,503
OH	x	x	x		x		4,582
OK	x	x		x	x		280,982
OR						x	47,625
SD	x	x	x	x	x		884
TN	x	x	x				2,155
TX	x	x					1,025,550
UT	x	x		x			8,993
VA						x	1,003
WA						x	37,802
WI				x			362
WY	x	x	x	x	x		87,419

[1]Conservation purposes only. Since there is no oil or gas mined in Georgia there is no income.

Sources: Columns 1-6 are March, 1978 data, from Commerce Clearing House, Inc. *State Tax Guide: All States.* New York, Chicago and Washington, 1967 (with updated supplements to March 1978).

Column 7 is from U.S. Bureau of the Census, *State Tax Collections in 1979,* as reported in *The Book of the States 1980-81,* The Council of State Governments, 1980.

Plain bogs that were considered practically worthless only a decade ago – are among the highest in the nation, and North Carolina will be the first state to begin large-scale production of peat. Already, there are plans to construct a peat-methane conversion plant and a peat-fired electric power plant in eastern North Carolina. Possible threats to water quality and wildlife habitats will require extensive environmental monitoring by the state, and a Department of Natural Resources and Community Development staff paper this year suggested that a severance tax on peat might be needed to defray the costs of this environmental monitoring.*

Because the severance tax proposal, as drafted, applies to *all* mining products, it has drawn criticism from another industry. The severance tax would create "useless inflation, more government, higher road maintenance costs, few highway miles per dollar, and economic upheaval," said the North Carolina Aggregates Association, a sand, gravel, and crushed stone trade association. Half the state's sand, gravel, and stone output is sold for use in state-funded road projects. Thus, an increased tax on sand and stone would be passed along to the purchaser and would raise the cost of highway construction.

The severance tax would be assessed against the gross value of all minerals, including phosphate, peat, stone, sand, gravel and lesser products, at the time they are removed from the ground. The percentage rate in the bill, as introduced by Rep. Charles Holt (D-Cumberland), was left blank, but that was a typographical error according to State Budget Officer John A. Williams, who said the proposal was meant to include a four percent tax rate.

Is the Hunt Administration Backing Off?

In an interview, Williams said that Hunt is not pushing either the severance tax or the repeal of the depletion allowance. "We offered the legislation as alternatives," Williams said. But when asked to discuss the two measures, Williams emphasized the problems the severance tax raised with various industries. "We got resistance on the severance tax. Attention was called to the fact that the state is the largest customer for crushed stone in the state, and the severance tax would increase the cost of building highways. The phosphate companies said paying this tax in North Carolina would not make them competitive in other states and therefore would suppress development here."

*"Report of Peat Mining Task Force" submitted to Natural Resources and Community Development Secretary Howard Lee, March 25, 1981, by the 12-member group comprised entirely of NRCD staff.

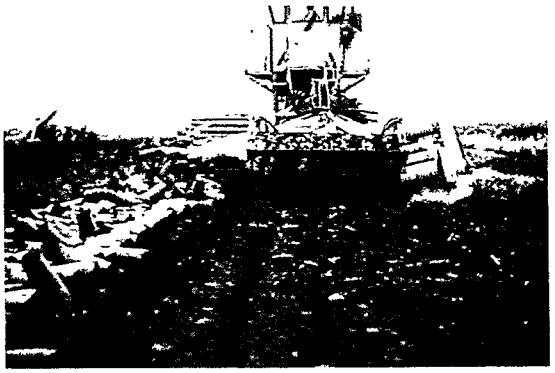


Photo courtesy of N.C. Electric Membership Corp.

Mining peat at First Colony Farms in eastern North Carolina.

In discussing the alternatives, Williams seemed to favor the depletion allowance repeal. "Small miners came in and said, 'We aren't making five percent, and if you take four percent, we can't exist.' These are good and valid reasons why the severance tax shouldn't be imposed on individual industries, and we think they are going to get a lot of attention," Williams said. On the other hand, Williams said that if the depletion allowance were repealed, people who have income from minerals would be taxed on the same basis as people who do not. "I think that [argument] may have a lot more appeal to some people in the General Assembly."

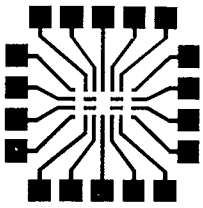
Williams estimated that one-fourth of severance tax revenues would be lost to increased stone and gravel costs paid by the state. "It really places a tax burden [on the state] without knowing there's the income [from minerals] to pay the tax. The severance tax is harder to sell," said Williams. The only advantage Williams cited for a severance tax was that it would raise more money.

Williams did not discuss – nor has Hunt in any public statements discussed – the environmental or moral concerns involved in this issue. A Department of Natural Resources and Community Development report suggesting the need for a severance tax to fund environmental monitoring of peat mining does indicate some environmental sensitivity within the Hunt administration. But for the mention in that report, there has not yet been a voice raised in the Hunt administration or the General Assembly to counter the complaints voiced by mining interests.

Lawmakers and Hunt administration officials seem absorbed, instead, in fiscal and political decisions. But if they do not consider other factors, the state's mineral resources become just another set of numbers to be used to balance a budget. Meanwhile, commercial ventures are extracting nonrenewable resources from the state in ever-increasing amounts without compensating the state for that irretrievable loss. □

Microelectronics — The Key to the Future

by Governor James B. Hunt, Jr.



In August 1981, Governor James B. Hunt, Jr. wrote a column on microelectronics for the vacationing Bill Noblitt of the Association of Afternoon Dailies (of North Carolina). Portions of that column appear below, with permission of the Governor's press office, outlining the Governor's current thinking on the recruitment of the microelectronics industry to North Carolina.

"Chips" – some people call them the crude oil of the 1980s. The Japanese call them the "rice of the industry." One "chip" is smaller than your fingernail and can process huge amounts of information that once required room-sized computers. We are increasingly becoming a computer-oriented society, and "chips" are the raw materials of this new technology.

As Governor, I am working to attract the microelectronics industry, which produces the "chips," and other high-technology industries to North Carolina to provide more high-skilled, high-paying jobs for our people.

The 1981 General Assembly, at my urging, provided $24.4 million for a Microelectronics Center of North Carolina. North Carolina can become the East Coast center for this industry, and that is why I urged establishment of this new Microelectronics Center. The Center will be a magnet for microelectronics research and development companies. And companies that use the "chips" will be attracted to all parts of our state.

Our Microelectronics Center is the first in the nation to combine strong academic and research institutions and strong state leadership and support. The Center will bring together the resources of five separate universities, an outstanding community college system plus the private research capabilities of the Research Triangle Institute.

The value of microelectronics production in the United States is expected to grow from $8 billion last year to $20 billion in 1985. The microelectronics industry and its support industries are looking for room to expand – the firms are physically outgrowing the Silicon Valley area of California where most are now clustered.

That kind of overcrowding cannot happen here. Expansion in Silicon Valley is strictly limited by the Santa Cruz Mountains on one side and the San Francisco Bay on the other. But in North Carolina, the industry can locate throughout the state, with no real physical limitations. To have the equivalent in North Carolina of the overcrowding in the San Francisco Peninsula, two million people would have to live and work in a seven-mile-wide strip along I-85 from Mebane to Greensboro. We are prepared to do the kind of planning needed to ensure adequate housing, water, and so forth as a result of the industry locating here.

North Carolina is attractive to most industries already. That is proven by the more than $8.5 billion in industrial investment announced by industry since January 1977 and the more than 135,000 new industrial jobs that will result from that investment.

Through the Microelectronics Center, we can provide the trained people and research capabilities needed by the microelectronics industry, and at the same time provide the overall atmosphere desired by all industry. General Electric's decision to locate its major new microelectronics research and development facility in North Carolina proves that we can attract that industry.

And attracting those companies here means more high-paying jobs for our people. In January the average hourly manufacturing wage in North Carolina was $5.77. In electronics it was $6.90. Nationally, in December 1980 that wage for production workers in the microelectronics industry was $7.22.

For too long, North Carolina has been on the bottom rungs of the ladder in terms of per-capita income, manufacturing wages, and so on. If we're going to be more than 49th or 50th [in manufacturing wages] or 39th or 40th [in per-capita income], we need a dramatic breakthrough.

I believe the microelectronics industry is our chance – perhaps the only chance that will come along in our lifetime. High technology holds the key to the future. I believe North Carolina can take that key and unlock a future of better jobs and better opportunities for our people. □

James B. Hunt, Jr. was elected Governor of North Carolina in 1976, and re-elected to a second four-year term in 1980. He had previously served as the Lieutenant Governor from 1973-77.

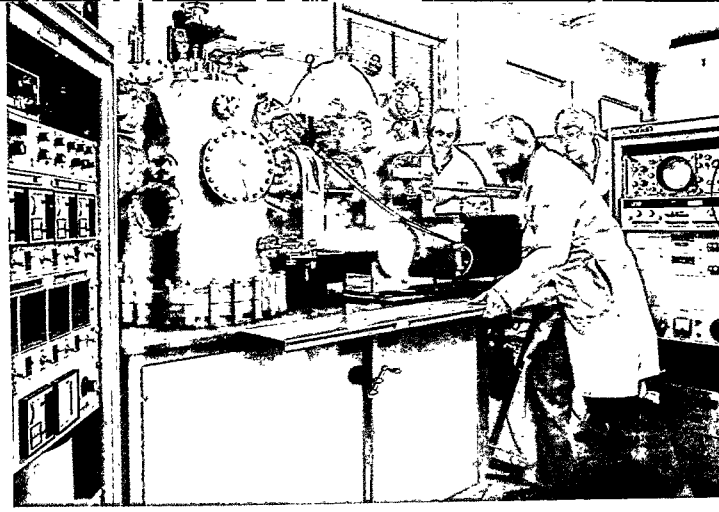
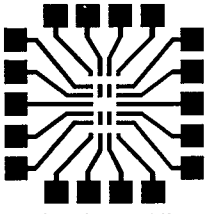


Photo by Chip Henderson, courtesy of N.C. Department of Commerce

Microelectronics:
Easy Angling in Legislative Waters

by Stephen R. Kelly



It was hotter than a handful of glowing vacuum tubes in the press conference room of the Department of Administration last June 30 as a line of speakers waded through the heat to talk about a cool new wave of technology. The speakers – academics, scientists and interested citizens – were addressing the hazards and high points of microelectronics, the term loosely applied to the manufacture and use of the tiny silicon wafers that power a computerized America.

For more than a year, Gov. James B. Hunt had been trolling east and west to attract microelectronics companies and their explosive growth to North Carolina. Hunt had also been fishing the waters of the N.C. General Assembly, hoping to snag a $24.4 million state appropriation for a microelectronics research and training center he hoped would prove an irresistible lure.

But several public interest groups, including the sponsors of this informal hearing, the Durham-based North Carolina Occupational Safety and Health Project (NCOSH), were worried the state was rushing into the microelectronics business without a meaningful debate on either the industry's risks or rewards. "We have attempted in every way we could to get the legislature of this state to hold this type of a hearing," Dub Gulley of NCOSH told the sweaty audience. "Since they have not seen fit to do so, we are here today."

Equipment at North Carolina State University, such as this machine, is used to develop materials for the fabrication of microelectronics chips.

Not all the invited speakers showed up, however. Absent were a spokesman for General Electric, which had already broken ground for a $100 million microelectronics plant near Raleigh, and Commerce Secretary D.M. "Lauch" Faircloth, whose department had done most of the industrial recruiting. Also absent was George Herbert, chairman of the board of the Microelectronics Center of North Carolina, the corporation established with state funds to plan and build Hunt's center.

But Herbert did send along some remarks. "Not doubting the sincerity of those who express concerns about some aspects of the microelectronics industry," Herbert's statement began, "most negative statements are based largely on a lack of knowledge about the current technologies, processes, and wages of the microelectronics industry."

Herbert's statement, and the entire hearing, contained several ironies. It took place in the very room where Hunt and Herbert had so often extolled microelectronics to the state's media as the bootstraps by which North Carolina could pull itself from its perennnial last-place ranking in average manufacturing wages. Hunt seldom shied from theatrics or hyperbole during these sessions, once spending $1,300 on a television-satellite

Since 1979, Stephen R. Kelly has been a reporter for The Charlotte Observer*'s Raleigh bureau.*

hookup from Denver to Raleigh to announce the capture of the General Electric plant and to bill microelectronics as "the fastest growing industry in the world." On another occasion, Hunt deadpanned that his microelectronics push was "the biggest step any state in the nation has ever made." And in a slick brochure introducing the Microelectronics Center, Hunt described the industry as "our chance – perhaps the only chance that will come along in our lifetime – to make a dramatic breakthrough in elevating the wages and per capita income of the people of this state."

In another irony, the state Senate that very June afternoon, with no mention of microelectronics, approved a state budget containing $24.4 million to build and equip Hunt's Microelectronics Center, one of the largest single appropriations for a new project in the supposedly tight budget. A few days later, the House did likewise, with only a brief and ineffectual protest about the industry Hunt was trying so hard to woo. The legislators had thus appropriated large and continuing sums of state money to a project about which, as Herbert noted in his written statement, public knowledge was limited.

They had done it virtually without controversy, despite the doubts expressed by outside groups such as NCOSH, and in sharp contrast to the donnybrook that had broken out over Hunt's proposed increase in gasoline taxes.

For a variety of reasons – the nature of the budget process, the strong backing of the Hunt administration, the desperate desire to create jobs – the lawmakers had committed the state to an economic development strategy about which few knew anything beyond what the Hunt administration had told them. "I hate to say they knew little or less than they should have," said Rep. Wilma Woodard (D-Wake), one of only three legislators to attend the NCOSH hearing. "I just have a feeling they took it on faith."

"Who the hell knows anything about microelectronics?" said Sen. Marshall Rauch (D-Gaston), who sat on the Advisory Budget Commission that originally approved Hunt's request. "In my opinion, the legislators just accepted what they considered fact from the Governor."

The push to make North Carolina a top contender for the microelectronics industry was born of the convergence of ongoing research and a good piece of luck. Throughout the 1970s, scientists at several North Carolina universities had been studying semiconductors, the materials that form the base of microelectronics' integrated circuits. To attract research grants, some of those scientists had even begun pooling their efforts with their counterparts at the Research Triangle Institute (RTI), a scientific think tank located in the successful Research Triangle Park between Raleigh, Durham, and Chapel Hill.

At the same time, the N.C. Science and Technology Committee, a group of researchers, academics, and state officials, had begun to explore microelectronics as a point of focus for its own research grants.* The Committee believed the industry's rapid growth, capacity for creating jobs, and likelihood of continued expansion offered great promise for the state and in late 1977 briefed Hunt on its work. While Hunt seemed interested, nothing further happened until early 1980, when a potential windfall tumbled North Carolina's way.

General Electric, the ninth largest corporation in the country, informed Hunt that it was eyeing a North Carolina location as one of some 25 possible sites nationwide for a new $100 million microelectronics research, development, and production plant. Company officials also told Hunt they would make a decision by August 1. Now confronted not just by a theoretical scheme for future economic development but by a live prospect as well – one that any governor would like to land – Hunt decided to act.

In the first week of April 1980, the Governor called together the heads of Duke University, the 16-campus University of North Carolina (UNC) system, and the state's community college system to discuss the feasibility of launching the state into a microelectronics boom similar to that of California's Silicon Valley, the industrial basin south of San Francisco that harbors a third of the country's microelectronics companies. In the 1960s and 1970s, Silicon Valley had sprouted up around Stanford University's Integrated Circuits Laboratory, whose technical support was credited with starting and sustaining the growth of the microelectronics industry there. Hunt wanted to know, first, if North Carolina should pool the resources of its own educational and research facilities to attract the industry in general, and snare General Electric in particular. And, second, if it was a good idea, Hunt wanted to know how to do it.

UNC President William Friday took on the first question, and a study group headed by Hunt's science advisor, Dr. Quentin Lindsey, tackled the second. On June 2, they reported back: yes, it seemed like a good idea. "If we can establish a visible and successful microelectronics education and research program, it should prove a powerful attraction for industrial microelectronics facilities and a stimulus for the creation of small high-technology business here," said the group's draft

*The group is now called the N.C. Board of Science and Technology.

Courtesy of Duane Powell, *The News and Observer*

report.

In answer to Hunt's second question – how to do it – the group suggested a nonprofit corporation made up of the institutions already active in microelectronics – Duke University, the University of North Carolina at Chapel Hill, North Carolina State University, North Carolina A&T, and Research Triangle Institute (soon thereafter, the University of North Carolina at Charlotte joined the effort). The corporation would use state funds to establish a research and training center in the Research Triangle Park that students from all the participating schools could use and from which new industry could benefit in both trained manpower and in research advances.

Building a central facility, sharing the costs and benefits of its exorbitantly priced equipment, and using it to lure semiconductor companies to the state all seemed like good ideas. They also fit squarely into the most beloved theme of Hunt's 1980 re-election campaign – economic development – which out on the stump translated into jobs, jobs, jobs. But time was critically short. General Electric would make up its mind in less than two months. And given the rapidly evolving field, as the draft report noted, "It is almost too late to enter the microelectronics race: next year will be too late."

On June 19, Hunt met with the study group and gave the go-ahead. Eight days later, he got $972,360 in first-year start-up money for the proposed Microelectronics Center from his Contingency and Emergency Fund. On July 16, the center was incorporated and held its first board meeting. On August 1, with a company official calling the center a "key factor" in the decision, General Electric decided to come to North Carolina.

In its rush, the study group had not been able to consider all the implications of the massive importation of a new and rapidly changing industry to the state and its environment. Dr. Lindsey later explained that the group felt the General Assembly could examine those questions when it met in 1981 to consider full funding for the center. But such an examination never really took place. The way in which Hunt got the center its initial funding was to have important implications later on.

The governor's Contingency and Emergency Fund is for use, as the name implies, in cases where insufficient time exists to check with the General Assembly or the Advisory Budget Commission (ABC), the ultra-powerful budget body made up of 12 gubernatorial and legislative appointees. Use of the emergency funds must be approved by the Council of State, made up of the elected heads of state departments, the governor, and lieutenant governor.

By using Contingency and Emergency funds, Hunt avoided going through the legislators for approval, even though they had adjourned from their summer budget session on June 25, 1980, only two days before Hunt sought and won the funds from the Council of State. Hunt's budget officer, John A. Williams, said the funds were used because there simply wasn't time to prepare a special funding request to run by the lawmakers. "In no way was this done in order to avoid involvement with the General Assembly," Williams said. But the move would later allow Hunt to point out to the General Assembly when it met for its regular full session in January 1981 that the state had already invested nearly $1 million in the center. Legislators are generally more partial to projects in which the state already has something invested than projects being started from scratch.

In early October 1980, Herbert, who doubles as president of RTI and chairman of the Microelectronics Center board, sent a two-year request for the 1981-1983 budget to Hunt's budget office asking for approximately $24 million to build, equip, and staff the center. Another $6 million eventually was to come from other sources. The budget office forwarded Herbert's request to the ABC, which takes the governor's budget requests, adds its own, and puts together the proposed budget for final approval by the General Assembly. Since the ABC is made up of the chairmen of the legislature's top money committees, its recommendations are only rarely altered in the rest of the legislative process, because few lawmakers are willing to quibble with the same budget bosses who control the appropriations for everyone's special bills.

While the ABC was still deliberating in November, Hunt took a well-publicized trip to Silicon Valley to court microelectronics firms. There he made the center part of his pitch, announcing to industry executives that he was seeking $24 million for the center from the legislature. Upon his return, Hunt told reporters the microelectronics funding was his top budget priority.

When it finished work in December, the ABC included $24.4 million over two years for the Microelectronics Center and the request appeared in the budget bill introduced in the General Assembly in January 1981. Thus before the full legislature could get involved, Hunt had invested $1 million in state money in the center, advertised plans for it to the nation, attracted one company in part because of it, and won ABC approval of his budget request. "The Governor basically boxed the legislature in," said one legislative budget staffer. "He had the legislature facing essentially a *fait accompli*."

After the legislators arrived in Raleigh in January, the microelectronics request lay dormant for four months while the lawmakers tried to shrink a state budget many of them said was already bloated, given the unstable economy and federal budget cuts. Meanwhile, sources outside the legislature began to raise questions about the wisdom of Hunt's microelectronics push.

Reporters at one press conference asked Herbert if building the Microelectronics Center in the Research Triangle didn't contradict Hunt's highly-publicized policy of balanced growth – the spreading of new industry around the state. After all, the Triangle area is already better endowed with high-technology industry than are most other parts of the state, and the California experience suggests that microelectronics companies chose to cluster near Stanford University's laboratories in Silicon Valley rather than spread all over the state. Herbert responded then, and in a recent interview, that the semiconductor fabrication plants probably would initially cluster along the Piedmont Crescent, if not solely in the Research Triangle area. But Herbert predicted a later dispersion of the users of semiconductors, as opposed to their manufacturers, for whom proximity to a research and training center would not be as crucial.

The Conservation Council of North Carolina expressed concern about the environmental effects of an imported microelectronics industry, which produces a variety of corrosive and toxic hazardous wastes, and asked that money be used to study these effects if funding for a center was approved. NCOSH distributed literature to legislators warn-

Sample of equipment used at Data General, one of the electronics companies that has recently located facilities in North Carolina.

Photo by Chip Henderson, courtesy of N.C. Department of Commerce

ing of possible hazards to workers in microelectronics plants.

Academics at several Raleigh-area universities raised questions about water use, land planning, and wage levels in the microelectronics industry.

Compared to other protestors who stormed the 1981 session, however, the doubters on microelectronics were easy to ignore. They were mild, late to organize, and only the Conservation Council had a full-time lobbyist. Whatever the validity of the questions they were raising, the budget subcommittee that began reviewing Hunt's microelectronics request on May 12 seldom stopped to consider them.

In three separate meetings, during which Herbert and Commerce Secretary Faircloth lauded the industry and dismissed warnings about occupational safety as "scare statements," the subcommittee received only one formal presentation about the negative aspects of microelectronics. And that presentation, by a legislative staffer assigned to the subcommittee, was quickly rebutted by Herbert.

A standing request from the Conservation Council's lobbyist to address the subcommittee was denied by its chairman, Rep. Edd Nye (D-Bladen), this despite Nye's own stated preference for letting any interested parties address his subcommittee and a specific provision in the state's Executive Budget Act that "to these sessions... shall be admitted with the right to be heard all taxpayers or other persons interested in the estimates under consideration."* Nye said he denied the request because the appropriations committee chairmen, Sen. Harold Hardison (D-Lenoir) and Rep. Billy Watkins (D-Granville), told him a public hearing would be held for other points of view, and his subcommittee "should look at the fiscal aspects."

On May 20, Nye's subcommittee approved funding for the Microelectronics Center. Eight days later, Watkins scheduled a meeting on the issue for the full Joint Appropriations Committee, although its Senate leaders were away at another committee considering Hunt's proposed gas tax. But Watkins said even this meeting was not a public hearing, only an "informational session" for the benefit of committee members. The only speakers invited were UNC President Friday, Faircloth, and Herbert, all of whom, not surprisingly, agreed, as Faircloth put it, that the center was "one of the smartest investments this state can make."

No legislator ever asked for a true public hearing on the pros and cons of the microelectronics industry or the proposed center, and none was ever held, even though a total of 35 public hearings on topics ranging from litter control to day care were held during the 1981 session. By the time NCOSH mounted its own informal hearing in that steamy press conference room June 30, it had about the same effect on the budget juggernaut as a fly spattering on the windshield of a speeding 18-wheeler.

The smooth sailing and uncritical examination that characterized the Microelectronics Center's voyage through the legislative process was not expected by all legislative leaders. "I was surprised that it did not have more vocal opposition," said House Speaker Liston Ramsey (D-Madison), a veteran of the 1975 brouhaha over building a medical school at East Carolina University and the 1978 fight over the new veterinary school at North Carolina State University, budget proposals requiring similarly large appropriations.

While both of those fights invoked regional loyalties, noted Ramsey, the Microelectronics Center involved five universities spread from Charlotte to Raleigh. In addition, Ramsey said, where both school projects were likely to create employment for relatively small groups of people, the Microelectronics Center would help create jobs not only for the students enrolled but for thousands of other workers if it succeeds in bringing new companies to the state, a feature that made it especially attractive to lawmakers.

"I think people in this state, legislators especially, are hungry for good jobs for the people they represent," Ramsey said. "The legislators are grasping for some way to increase the average income in this state."

Other legislative hands explained the center's easy passage by pointing out that Hunt had all but committed the state to building the center before the lawmakers got to town, thus making resistance to what appeared an accomplished fact seem futile. Rep. Joe Mavretic (D-Edgecombe), who attended the NCOSH hearing as a panelist and gave Hunt's hazardous waste legislation its closest scrutiny, suggested the center also was spared from attack because it was safely ensconced in the budget package, which the governor and the ABC successfully defend as a unit.

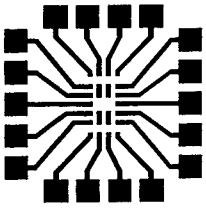
Finally, the legislators may just have been awed by the technology and the breadth of the microelectronics "revolution" predicted by Hunt. Where Hunt had to lobby vigourously to protect his gas tax and hazardous waste legislation, little effort was needed to keep lawmakers in line on microelectronics. Anxious to create jobs, equally anxious about affronting the powerful legislative leaders who control the budget, distracted by other controversial issues and presold by Hunt, the legislators were content to take Hunt's word that microelectronics, as Sen. Rauch wryly put it later, "was the greatest thing since popcorn."□

*G.S. 143-14.

Photo by Paul Cooper

Why North Carolina Needs The Microelectronics Center

by George R. Herbert



It perhaps is not well understood that the basic, primary goal of the program of which the Microelectronics Center of North Carolina (MCNC) is the most visible element is to achieve a significant increase in training and education, at all levels, to prepare North Carolinians for employment in the nation's fastest growing industry. Because the microelectronics industry is becoming increasingly dependent on the availability of highly skilled and educated workers, achieving a quantum jump in training and education, and related research, will have the effect of making North Carolina competitively more attractive than other states and regions, assuring our development as a major center for the industry which is destined to have a profound impact on the country's strength and economy for the rest of this century.

MCNC has *not* been created to provide industry with a facility, nor to subsidize industry. Rather its facilities and activities are to support the educational and research missions of the six participating institutions to enable those institutions to prepare greater numbers of people for careers in this new high technology industry. Simultaneously, the educational and research activities of the institutions and of MCNC will serve as a magnet to assure that opportunities for those careers are created in new industry here in North Carolina.

George Herbert (left) and C.W. Clark stand before the entrance to the temporary offices of the Microelectronics Center of North Carolina at the Research Triangle Park.

The use of integrated circuits" (very complex circuits consisting of thousands of transistors formed on the surface of a tiny ¼" silicon chip) is a development of only the last 20 years. The first integrated circuits consisted of only a few interconnected transistors (replacing the familiar vacuum tubes). Today's "chips" contain more than 10,000 transistors, and the technology is moving rapidly toward 100,000 on a "chip." These integrated circuits are the brains of pocket calculators, digital watches, microprocessors, and new automotive engine controls. They also are essential to modern communications systems and all satellites and space vehicles.

The industry's rate of growth is illustrated by an estimated production of $8 billion of integrated circuits in 1980, projected to grow to $20 billion

George R. Herbert is chairman of the board of directors of the Microelectronics Center of North Carolina and president of the Research Triangle Institute. On May 28, 1981, Mr. Herbert presented a "Statement Regarding Requested Budget Appropriation for Microelectronics Center of North Carolina" before the full Joint Appropriations Committee of the General Assembly. That statement is reprinted here with permission. (The portion on "Worker Safety and Environmental Considerations" appears as a "box" on pages 34-35.)

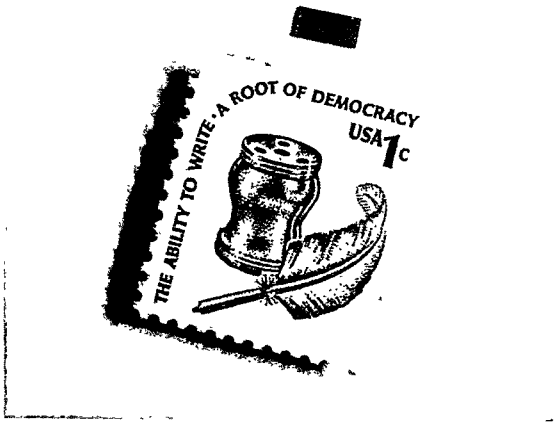


Photo by Chip Henderson, courtesy of N.C. Department of Commerce

A typical integraged circuit chip, compared in size to a postage stamp.

in 1985 and $40 billion by the end of this decade. Increasingly, integrated circuits are being used for control of appliance motors and for industrial controls. Every industry in North Carolina which now has controls using combinations of gears, pulleys, and levers will experience revolutionary changes with the future development of microelectronics.

The microelectronics industry is one of the few for which the United States can claim a position of world prominence, with slightly more than 60 percent of last year's total output of integrated circuits produced in this country. A real threat to our leadership now exists in Japan, where a massive combined effort of industry and government is aimed at overtaking the United States.

This also is an industry whose most critical resource is trained and educated people: engineers, physicists, and chemists for developing new technologies for fabricating circuits and computer scientists for computer aided design of the complex circuitry. It is this "people dependence" which is the focus of the MCNC program and which, if we are successful, can make North Carolina one of the centers of the industry.

Listening to some of us may convey the impression that we are just discovering the microelectronics industry. That is far from the truth, and our state has a strong, existing base on which to build the new program. Among our institutions, we have had teaching and research in semiconductor technology and in computer sciences for many years. And some of the biggest names in microelectronics are among our best corporate citizens: IBM, Western Electric, Data General, and Northern Telecom. This is what makes North Carolina the leader in electronics among the southeastern states.

What we have not had is the integrated circuit portion of the industry, the design and production of the tiny chips that are at the heart of electronic products and systems and are the key to the microelectronic revolution that is taking place.

When we speak of high technology industry, we assume this equates with higher skill requirements and, in turn, with higher wages. It is fair to question this assumption, but a few numbers from a very recent Employment Security Commission survey, as reported in *The News and Observer* on March 22, 1981, answer the question. In January, the average hourly manufacturing wage in North Carolina was $5.77; in textiles $5.23. In electronics it was $6.90. Nationally, in December, the average hourly wage for production workers in the semiconductor industry was $7.22.

Purposes, Structure, and Funding

The specific purposes of MCNC are:

• To develop, operate, and make available, to all six participating institutions, facilities and equipment necessary for expansion of microelectronics education and research into areas of sophistication and complexity that otherwise would not be possible. Equipment needed to serve the requirements of all institutions, and of cost that precludes duplication, (electron beam system and central

Average Hourly Wages For Production Workers In North Carolina Industries

January, 1981*

Apparel	$4.38
Lumber, wood	4.91
Furniture	5.17
Textiles	5.23
Food	5.50
All Industry Average	**5.77**
Printing	6.31
Stone, clay, and glass	6.36
Transportation	6.42
Non-electrical machinery	6.53
Rubber	6.89
Electronics	**6.90**
Chemicals	7.06
Paper	8.57
Tobacco	9.02

(Note: Nationally the average wage for production workers in the semiconductor industry, in December, 1980, was $7.22)

*Employment Security Commission survey reported in *The News and Observer*, March 22, 1981.

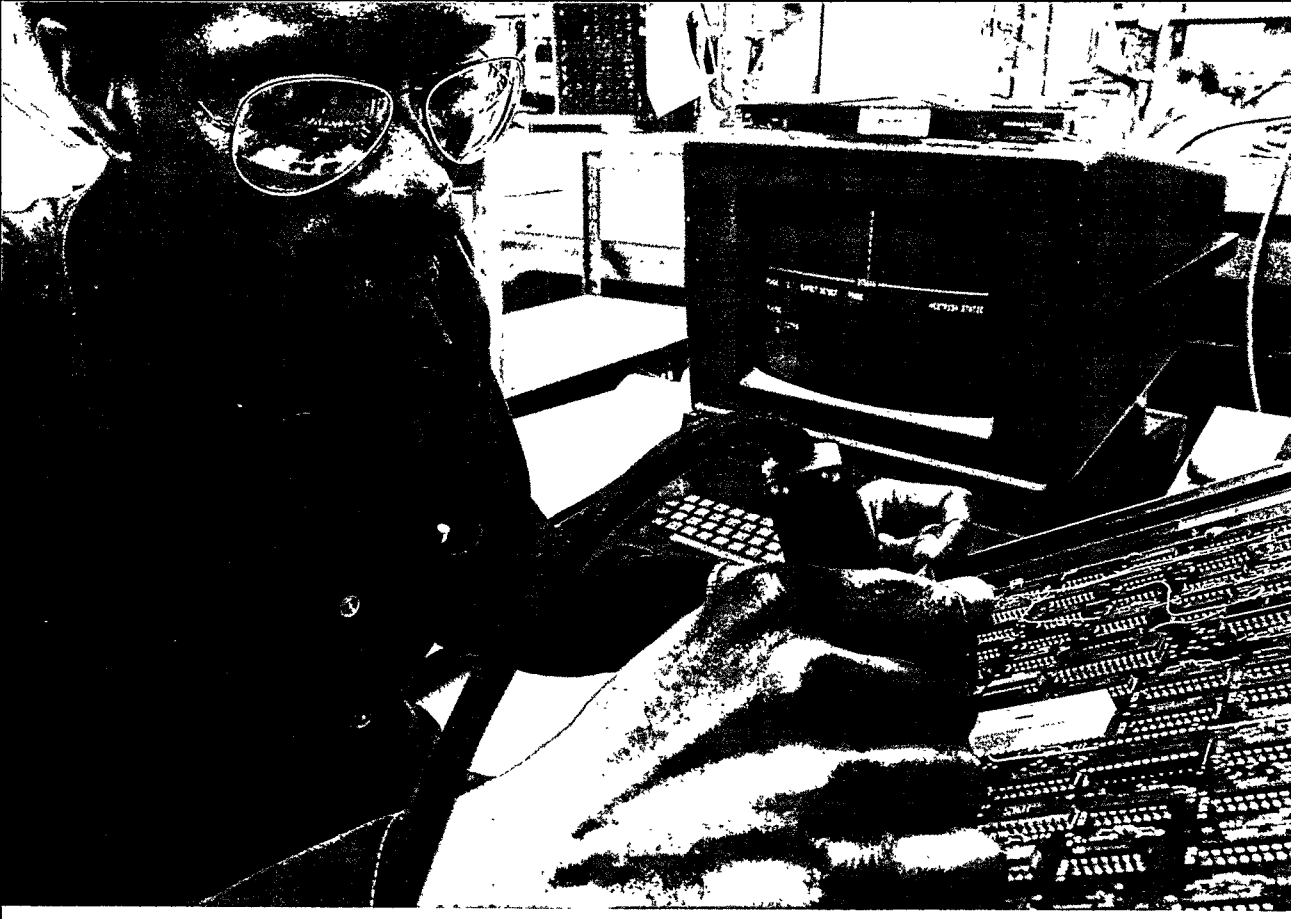


Photo by Chip Henderson, courtesy of N.C. Department of Commerce

Checking a circuit assembly at Northern Telecom

computer, as examples) will be housed in a central facility in Research Triangle Park. Other MCNC equipment more directly related to the programs of individual institutions will be located and operated on campuses but available to all participants.

- To assist in planning, developing and coordinating new educational and research programs, particularly those involving more than a single institution, and to assist in obtaining external funding.
- To provide a new, and additional, channel of communication and liaison with industry and federal agencies.
- To conduct research to advance the technologies necessary for integrated circuit design and fabrication.
- To assist appropriate state agencies in developing a strong microelectronics industry throughout North Carolina.

MCNC was incorporated as a North Carolina not-for-profit corporation in July 1980. The participating institutions are: University of North Carolina at Chapel Hill, North Carolina State University, North Carolina A&T State University, University of North Carolina at Charlotte, Duke University, and Research Triangle Institute.

Articles of Incorporation and By-laws stipulate that the 12-person Board of Directors shall consist of: the Chancellors of the five universities, five persons appointed by the Governor, one of whom shall be a representative of state government, a representative of Research Triangle Institute, and the President of MCNC.

The planned use of requested funds are:

Structure for Central MCNC facility and modification of campus space to be occupied by MCNC facilities	$10,436,000
Initial major equipment	8,650,000
Direct operating costs of Center (Salaries & fringe benefits, materials and supplies, travel, communications, utilities, services, etc.)	2,822,000
Programmatic expenditures and graduate fellowships at the institutions	2,450,000

In addition to the state funds request, it is the goal of MCNC and the six participating institutions to generate approximately $5.6 million in non-state funds (corporate, federal, and foundations) during the biennium for other equipment, operating costs, and activities at the institutions directly

related to the MCNC program.

There are two principal types of accountability: functional and fiscal. The first relates to assuring that the organization serves its intended purposes and the second guarantees responsible and prudent management of assets and use of funds made available. As with any corporation, ultimate responsibility rests with MCNC's Board of Directors. With respect to functional responsibility, the designated membership of the university chancellors assures that MCNC always will serve a primary function of supporting the educational and research activities of the institutions. Similarly, the five members appointed by the Governor assure responsiveness to the broader needs of the state.

In exercising its responsibility for fiscal accountability, the Board approves all major commitments of funds for facilities, equipment, and programs. As an additional guarantee that state monies are used for the intended purposes, the existing contract between the state and MCNC, for conveyance of funds, lists the categories for which funds are to be used and requires that an annual audit be performed by independent certified public accountants (currently Price, Waterhouse & Co.) and submitted to the state.

In addition to state funding, of which a major portion of the 1981-83 request consists of a one-time, non-repetitive investment in building and key equipment, MCNC is expected to generate non-state funding from a variety of sources, including:

- federal grants and contracts to MCNC and to the participating institutions for equipment and research;
- facility use charges for externally funded research performed by the institutions;
- annual Industrial Affiliate Support payment; and
- private foundation grants.

After completing the complement of equipment when the building is completed, the combination of above funding sources will enable state funding to decline to a fraction of the amount currently requested – only that necessary to make the facilities available to the universities, without cost, for educational purposes.

Expected Educational and Economic Impact

Since the ultimate purpose of MCNC is to permit a substantial increase in the number of young people being educated for careers in the rapidly growing microelectronics industry, simultaneously making our state more attractive to that industry, we undertook an inventory of undergraduate and graduate students in electrical engineering and computer sciences at the five universities and asked for near-term and long-term projections based on the establishment of MCNC.

During this academic year there were slightly more than 2,000 undergraduate students in these two fields and 273 graduate students. The near-term projections indicate an expected increase in graduate enrollment alone to nearly 400 by the 1982-83 academic year.

The references here are only to electrical engineering and computer sciences. Other important fields, which also look toward growth in student output, include physics, chemistry, and materials engineering.

In time, I believe we can anticipate the involvement of other universities in the state. This was evidenced by an exchange of correspondence earlier this year with Chancellor John Thomas, of Appalachian State University, who indicated the desire of his institution to participate and contribute. Nor should we overlook the vital role of the Community College System in training technicians for the industry, and President Larry Blake already is guiding the planning for programs to train semiconductor technicians.

As expected, the MCNC program to expand microelectronics education and research in the institutions of the state increasingly is drawing the attention of national industry to North Carolina as the potential new center of microelectronics activity.

One single example, the new General Electric Microelectronics Center, may be seen as a harbinger of what can come. Originally announced as an investment of approximately $50 million, an amount of $100 million has more recently been publicly acknowledged, and, while initial employment has been estimated in the 150-200 range, GE officials have said that, if operations go well and future plans approved, employment could grow to 1000.

Of even greater importance for the future is the fact that every existing industry in North Carolina can expect to have its equipment, processes, or products changed and improved as the microelectronics revolution continues through the rest of this century. In addition, the state or region which becomes a center of the microelectronics industry can expect to attract an increasing share of the manufacturing industries which incorporate integrated circuits in their products.

Whether it happens in North Carolina, or in other states and regions, it will happen. Our goal is to train and educate increasing numbers of young people for careers in this vital industry and then, by creating a magnet for the microelectronics industry, assuring that their job opportunities will be here in North Carolina.□

Promises and Policies

The Economic Hope of the Microelectronics Industry

by Michael I. Luger

"Literally the chance of a lifetime.... [It] can change the course of North Carolina."

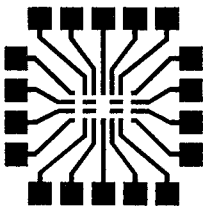
– Gov. James B. Hunt

"Microelectronics could be the goose that lays the golden eggs."

– Howard Lee, former Secretary of Natural Resources and Community Development

"The crude oil of the 1980s."

– George Herbert, chairman of the board of the Microelectronics Center of North Carolina



During the spring of 1981, state leaders used the promise of new microelectronics jobs and higher wages to convince the General Assembly to approve $24.4 million for the Microelectronics Center of North Carolina (MCNC). Such a promise, however, does not necessarily represent the economic reality of the microelectronics issue. The complexity of the employment and growth questions surrounding the industry make accurate predictions extremely difficult. Moreover, corporate decisions which have not yet been made may ultimately determine whether the goose will in fact lay a golden egg. If the microelectronics recruitment policy embraced by the Hunt administration is not the panacea for unemployment and low wages in North Carolina, other measures should be considered.

The Importance of Skill Level and Location

How successfully can the microelectronics recruitment efforts help boost wages and job opportunities for North Carolinians? The answer to this critical question depends on how well a resulting supply of new jobs "matches" the existing pool of unemployed workers in the state. To analyze this match, two economic characteristics of primary importance must be examined for both the newly created jobs and the unemployed workers – "skill" and "location."

The skill composition of new jobs. The microelectronics industry employs skilled, semi-skilled, and unskilled workers. The skilled work force includes managers, engineers, and highly-trained machinists; the semi-skilled work force includes inspectors, technicians, and clerical employees; and the unskilled work force consists of custodians and assemblers.

Different types of plants employ different mixes

Michael Luger is assistant professor of public policy studies and economics at Duke University. *The author is indebted to AnnaLee Saxenian of the University of California, Berkeley, for sharing the results of her unpublished research on the microelectronics industry in California, which includes the interviews referred to in this article. Photos by Chip Henderson.*

of employees, by skill. Plants which primarily conduct research and development use a high proportion of skilled workers while assembly establishments employ a relatively high percentage of unskilled workers. For all microelectronics plants in California's Santa Clara County, roughly 40.0 percent of the work force is skilled, 22.5 percent is semi-skilled, and 37.5 is unskilled.[1]

The skill breakdown which characterizes microelectronics plants in California will not be exactly reproduced in North Carolina since the Tar Heel state will contain a different mix of plant types. In a series of interviews conducted in 1980-81 with microelectronics officials in California, company spokesmen indicated that research and development and assembly facilities were much less likely to be moved to North Carolina than were "mask-making" and "wafer-fabrication" plants. According to these officials, research and development operations need to be near corporate headquarters, which will be maintained in California in most cases. Assembly plants will not be moved to North Carolina because labor is less expensive abroad, especially in Mexico, the Philippines, and Southeast Asia.

Mask making and wafer fabrication are chemical processes in which electrical properties are imparted to silicon wafers which are then tested and cut into "chips." Because these processes involve constant testing and calibration, a relatively large number of engineers and technicians are required. Though data do not exist on the skill composition of mask-making and wafer-fabrication plants alone, the breakdown would be approximately 35 percent managerial and professional, 40 percent semi-skilled, and 25 percent unskilled.[2]

The skill composition of unemployed workers. North Carolina Employment Security Commission data reveal that approximately 95 percent of all unemployed workers registering with the Commission in 1980 were unskilled. Of this unskilled group, roughly three-quarters had production work experience, especially in the construction and textile industries.[3] Hence, the pool of unemployed workers with training in any skill is very small.

The location of new jobs. Virtually all of the industry officials interviewed stressed the need for mask-making and wafer-fabrication facilities to be located near national airports and major universities. In addition, given the nature of these manufacturing processes, these officials would find proximity to the Microelectronics Center advantageous. (See the preceding article by George Herbert for an explanation of how the Microelectronics Center, which is located in the Research Triangle Park, will function.) These factors indicate, then, that most of the new electronics jobs created in North Carolina will be located in and around the Research Triangle, perhaps stretching as far west as Greensboro. This area could be referred to as the "projected location zone." (See maps on page 29.)

The location of unemployed workers. There are three areas of widespread unemployment in North Carolina: the far west, particularly Swain and Graham counties; the northern tier, especially the ten-county area northeast of the Research Triangle; and the south, from Carteret County west to the suburbs of Charlotte (see "Areas of High and Low Unemployment" map). Except for Alamance, all counties within the projected location zone had unemployment rates less than six percent in 1980. The average rate for the entire seven-county area was five percent, which by some definitions is "full employment."

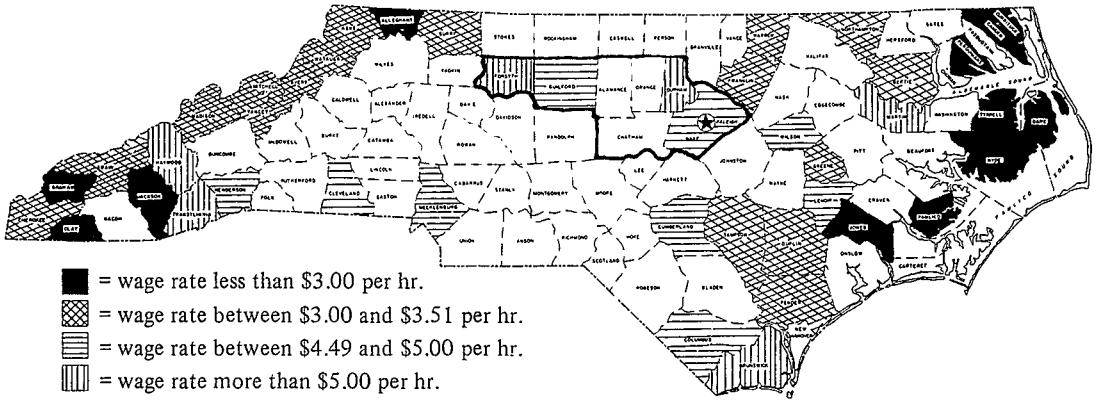
Conclusions About Skill Level and Location Factors

The analysis of skill composition and location factors leads to the conclusion that newly created electronics jobs and existing unemployment will not be particularly well matched in at least three ways.

(1) *The demand by new facilities for skilled*

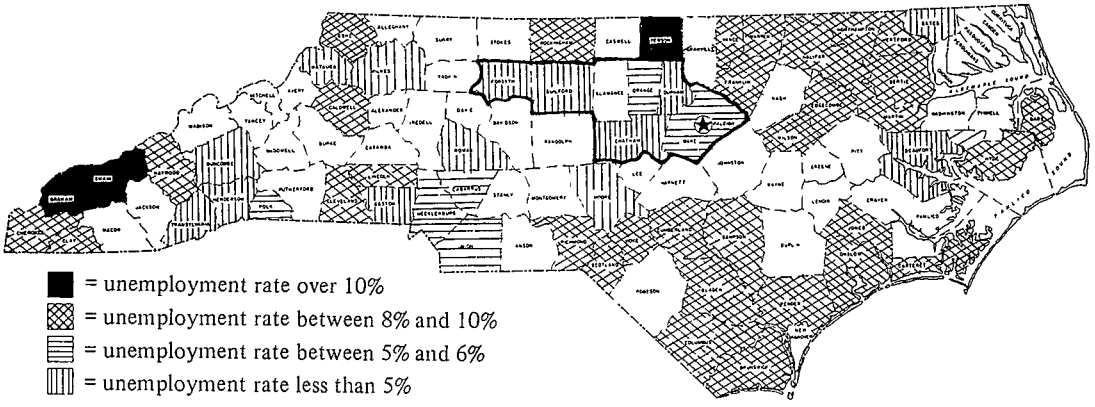
Students and instructor in the engineering technology program at Johnston Technical College.

Areas of High and Low Wages, 1978



Source: *North Carolina County Labor Profiles,* North Carolina Department of Commerce, Business Assistance Division.

Areas of High and Low Unemployment, 1980



Source: Employment Security Commission, Research Division.

In the maps above, the heavy dark line around a seven-county area stretching from Wake to Guilford surrounds the "projected location zone" for new microelectronics facilities.

workers will far outstrip the existing supply of such workers, especially within the projected location zone, creating "labor-market tightness." Consequently, these plants will have to import skilled employees from other states or induce those who are already employed to switch jobs. The importation of skilled workers does not benefit current North Carolinians. The practice would have negative effects, in fact, if the imported workers caused the price of housing to rise in the projected location zone. The "bidding away" of already employed engineers, managers, and skilled machinists would redound to those workers' advantage in the form of higher wages, but these wage benefits would not necessarily filter down to the less skilled workers. Moreover, luring away skilled and professional personnel would cause labor shortages in nonelectronics businesses within the projected location zone unless those existing businesses were willing to exceed the wage offers made by the incoming plants. In the long run, this "wage war" would undermine the profitability of all businesses in the region.

Over time, the supply of skilled workers could be expanded via education and training programs. However, as a recent legislative study shows, the capacity of public educational institutions is not now sufficient to meet the projected demand for these workers.[4] While the Microelectronics Center is designed to help fill this gap, for the state to accommodate its new corporate residents it would have to allocate additional monies to expand university and MCNC programs.

(2) *There will also be an excess demand for semi-skilled workers within the projected location zone,* not only because there will not be enough workers who already possess the appropriate skills but also because there will be a shortage of workers

Wage Rates for Selected Jobs in Electronics, Santa Clara County, California, 1978

Unskilled	
Assembler, entry	$4.06
Receptionist	4.06
Shipping clerk	4.46
Stock clerk	4.74
Janitor	5.07
Machine operator	5.12
Assembler, highest level	5.58
Semi-skilled	
Secretary, intermediate	5.19
Electronics technician, junior	5.44
Test technician, intermediate	5.96
Fabrication inspector, senior	6.38
Journeyman machinist	8.22
Skilled	
Associate engineer	9.09
Tool and die maker	9.28

Source: From American Electronics Association, *Benchmark Wage and Salary Survey*, fall 1978, as reproduced by Axelrad, (see footnote 1 in text), Table 9, p. 25. Salaries reported for skilled jobs have been converted to wage rates to ensure comparability.

to train. The initial burden of this shortage will probably fall on nonelectronics producers already located in the area; employed, unskilled workers will be quite willing to submit to on-the-job training in microelectronics plants for jobs that will give them a wage boost.

Not all semi-skilled job slots can be filled by training workers within the plant, however. Many technical positions require experience and an understanding of practical electronics theory which can best be gained in technical schools, junior colleges, and the military. Again, to accommodate the needs of the new plants the state will have to develop appropriate training programs.

(3) *Since plants will locate in the Raleigh-Greensboro corridor, the new jobs will be out of commuting range* of many unskilled, unemployed workers in North Carolina. Even making the liberal assumption that workers will commute three hours daily, unemployed workers in over half the shaded counties on the "Areas of High and Low Unemployment" map would be unaffected by any microelectronics boom in the state. Such a result violates the intent of the Balanced Growth Policy ratified by the General Assembly in April 1979, since that policy committed the state to "encourage diversified job growth in different areas of the state, with particular attention to those groups which have suffered from high rates of unemployment or underemployment, so that sufficient work opportunities at high wage levels can exist where people live."[5]

Wage Rate Factors – What "Average" Can Hide

If the Hunt administration succeeds in inducing microelectronics firms to locate facilities in North Carolina, the average manufacturing wage rate in the state will rise. On its face, this outcome is desirable since the state ranks last in the nation in hourly manufacturing wage rates. However, average wage data can be misleading as an indicator of worker welfare because they do not reflect the extent to which wage rates differ among workers in different skill groups and locations.

In microelectronics, the wage rates of different skill groups vary significantly. In Santa Clara County, an entry-level assembler (unskilled) earns less than half of what a tool and die maker (skilled) gets paid (see box on this page). If portions of the industry do come to the Piedmont, this wage gap may widen. The wage rates of skilled and semi-skilled workers in the projected location zone will rise since there will be excess demand for such workers, especially in the short run. But the wage rates of unskilled workers – even those within the projected location zone – are not likely to rise by the same relative amount since demand for those types of workers will not significantly exceed supply. Thus, even though the microelectronics industry pays a higher average wage rate than other industries such as textiles, hosiery, or furniture, unskilled workers in microelectronics may not earn more than their counterparts in those other sectors. Average rates, then, refer to the industry, not to the worker.

In the case of new microelectronics jobs for North Carolina, the statewide, average wage coin has a flip side. The greatest wage increase will come in the projected location zone, but four of the seven counties in the area already have some of the highest wage rates in the state. Meanwhile, the job influx will exert no upward pressure on wages in the far eastern and western counties, where the wage rates are the lowest in the state (see "Areas of High and Low Wages" map). While the average wage rate for North Carolina might well increase as a result of the new microelectronics jobs, the benefits will be concentrated where they are generally needed least, again violating the balanced growth policy widely promoted by the Hunt administration and formally endorsed by the General Assembly. The more a microelectronics influx causes the average wage in North Carolina to increase, the greater the economic disparity between counties.

Microelectronics and Economic Development Strategies

The microelectronics recruitment policy cannot really be evaluated in isolation from other development efforts. In a position paper released last year entitled "An Economic Development Strategy for the 1980s," Governor Hunt assured the public that the state would aggressively recruit many different kinds of businesses. This broad-based recruiting is important in principle for two reasons. First, it is vital for the state to achieve a diversified economic base. The state's historical reliance on a few dominant industries (most recently, tobacco, textiles, and furniture) has not been wise economically or politically. Second, other industries might be more likely than microelectronics to match the skill composition and location of the existing unemployed. Then the limited "coverage" of the microelectronics industry – by location and skill – would be less of a problem.

But even an *industrial recruitment policy* that seeks other industries as well as microelectronics is inherently limited as an *economic development strategy.* As this discussion about microelectronics illustrates, the state has very little control over where any of its recruited industries locates. "Where does a 300-pound gorilla sit?" Secretary of Commerce D.M. (Lauch) Faircloth asked rhetorically, addressing a Duke University colloquium. "Wherever it pleases." By using industrial recruitment as the sole means of economic development the state cannot effectively plan its own future. In large part, the future is planned by others – primarily by private businesses – in an uncoordinated way.

Industrial recruitment undermines the state's control over its own destiny in another way. The plants that are moved to North Carolina usually belong to large, multi-plant, multi-locational firms headquartered in other states (and countries). These firms typically search beyond the borders of North Carolina for future profit opportunities. A company headquartered in California, for example, may decide to use the profits from a North Carolina plant to finance the construction of new microelectronics plants in Mississippi or Thailand or to buy another kind of company altogether. In time, the firm may shut down the North Carolina plant with a resulting loss of jobs.

Industrial recruitment is a suspect approach to economic development for one last reason. Most economists who study regional development agree that business incentives are not an important factor for firms making inter-regional location decisions. The microelectronics firms which are now being assiduously pursued by state officials could well have decided to come to North Carolina even

"Will California Keep the Silicon Valley Bonanza? Challenge from North Carolina"

This headline appeared in the August 1981 issue of California Journal, *a public-policy magazine in California. The article, written by* Journal *intern Libby Lane, describes the current pressures facing microelectronics industries in California in an historical context. As Ms. Lane puts it: "There are some problems that high-tech industries, site-location firms, and the California Manufacturers Association (CMA) worry about." She describes the problems under the headings of energy, permit processes and environmental regulations, transportation, taxes, business incentives, and housing and quality of life. She leads off the "business incentives" section with the paragraphs reprinted, with permission, below.*

When governors like Jim Hunt of North Carolina say to expanding high-tech industries, "We want you," the companies know there is going to be a concerted effort on the part of state and local governments to facilitate their move in any way possible. Some industry leaders complain that California transmits a negative attitude toward business growth, especially during the Brown Administration. Many states, in an effort to encourage growth, are offering business loans at low-interest rates if industries agree to build in a certain area and/or employ a certain number of persons.

North Carolina's Hunt epitomizes the effort of other states to win California's high-tech industries with promises of cheap land, open space, blue sky and a research triangle bounded by Duke University, North Carolina State University and the University of North Carolina. Those promises include many of the amenities that made the Silicon Valley a success three decades ago. An additional lure used by Hunt is a plan for training programs at the community colleges that will meet the educational and training needs of any high-tech company that agrees to settle in North Carolina.

if the General Assembly had not funded the Microelectronics Center. Other factors have already proven to be attractive to industry – a good climate, low workers' compensation insurance rates, relatively inexpensive housing, and perhaps most importantly, low wage rates and little unionization. (Only 6.5 percent of the labor force in North Carolina is unionized compared to 23.7 percent in California. In other states the percentage is even higher.)

The importance firms attach to wage rates and unionization in their location formula creates a dilemma for policymakers who want higher wages *and* more jobs for the state. If wage rates rise, firms will be discouraged from moving into North Carolina. If wage rates rise as a result of greater unionization, firms will be doubly discouraged from relocating here. This dilemma may explain why the Hunt administration seems to be relying on labor market tightness as a means to achieve higher wage rates for the state.

The state could de-emphasize industrial recruitment as an economic development strategy and handle the wage-jobs dilemma in other ways:

(1) If the state cannot induce established companies to move their headquarters into North Carolina, it should support the development of new enterprises owned by the state's citizens.

(2) Instead of relying on relocations from outside North Carolina, the state should encourage locally-owned small businesses to expand, especially in high unemployment areas.

(3) Rather than using labor-market tightness to increase wages in selected markets, the state should maintain a neutral policy toward union organization.

The first two of these proposals would enhance the state's control over its own future by helping to break a spiral of dependency on meeting the needs of corporations based outside North Carolina, a dependency that requires the state to discourage unionization. These two proposals would also allow the state to achieve the economic diversity that is so important. The third proposal would lead to uniformly higher wages since unionized workers receive up to 35 percent more pay than their nonunion counterparts doing similar work.[6]

All this is not to say that the recruitment of microelectronics or any other industry is a bad practice for the state to follow. But this traditional approach to economic development cannot by itself achieve the full range of employment outcomes to which North Carolinians are entitled. Industrial recruitment must be folded into a comprehensive economic development plan which puts as high a value on local control and balanced growth as it puts on job creation and wage rates. □

---

[1] These and other data about the microelectronics work force in Santa Clara County are from Marcie Axelrad, "Profile of the Electronics Industry Work Force in the Santa Clara Valley," unpublished manuscript, Project on Health and Safety in Electronics, July 1979, and from U.S. Department of Commerce, Bureau of the Census, *1977 Census of Manufacturers* (Washington, DC: USGPO, 1980). Most of Axelrad's data are for the entire electronics sector, but since that sector is mostly comprised of semiconductor plants in Santa Clara County we can use the data to draw conclusions about microelectronics.

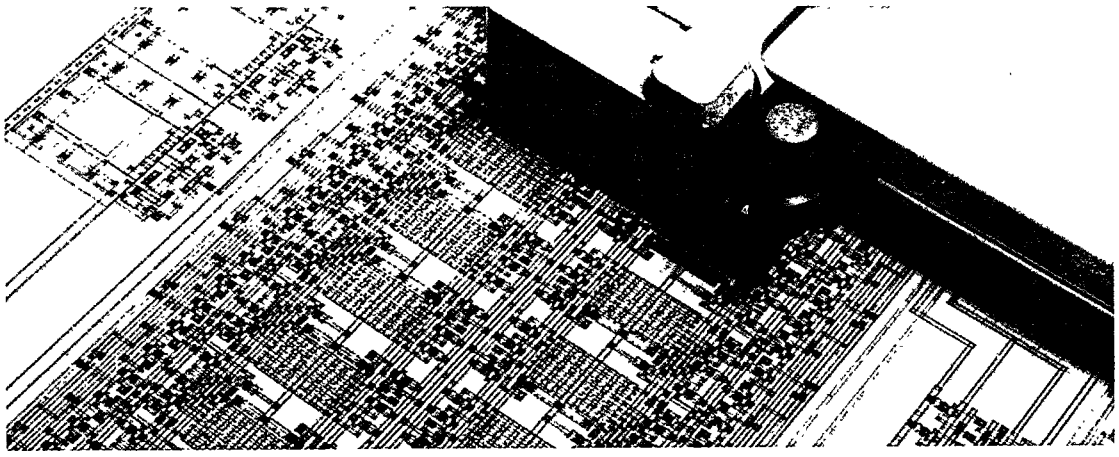
[2] I arrived at this approximation by subtracting from the Santa Clara figures cited in footnote 1 those employees who work only in assembly plants and research and development facilities.

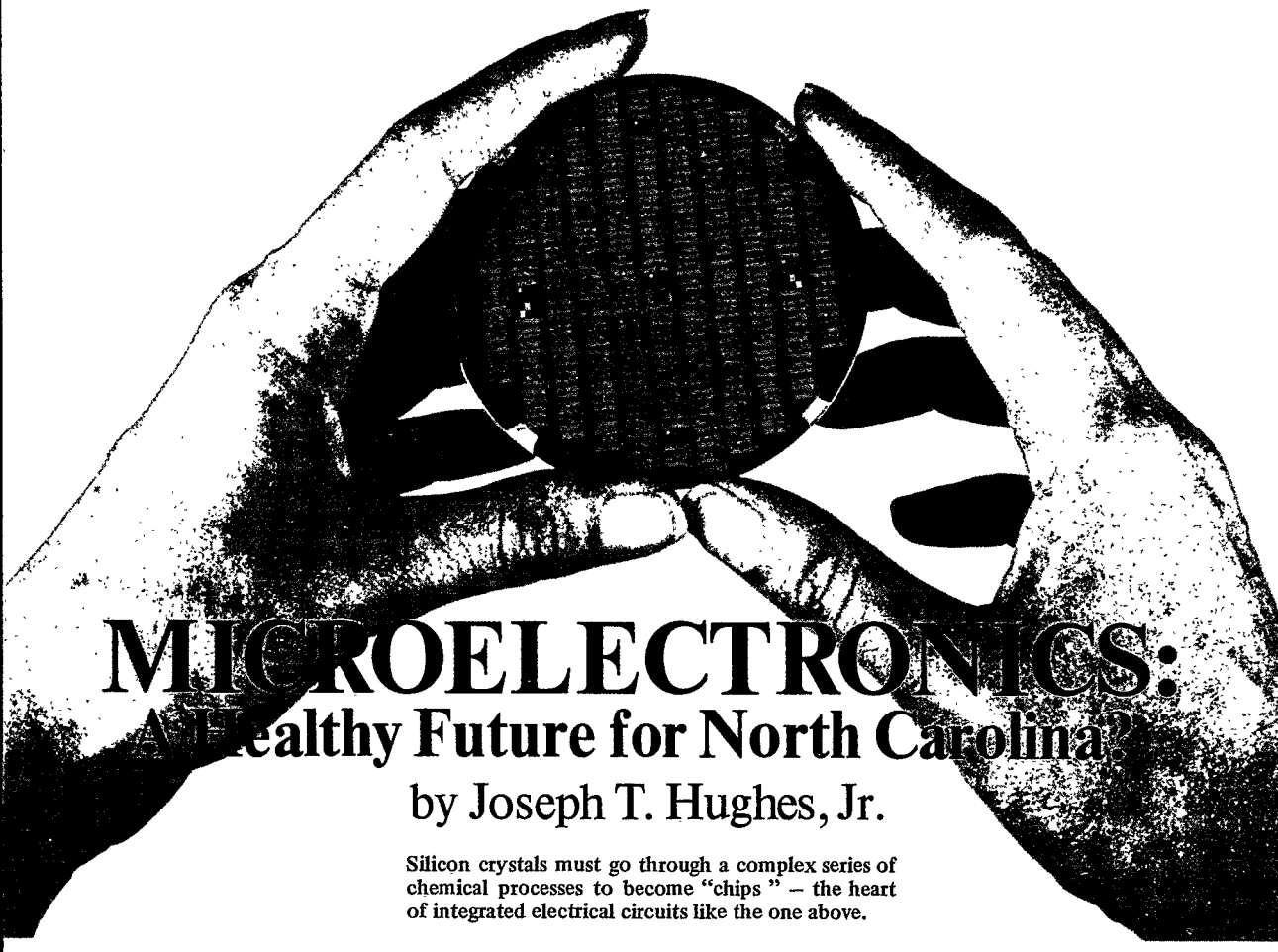
[3] From N.C. Employment Security Commission (ESC), *Characteristics of the Insured Unemployed* (Raleigh, May 1981) and interviews with the research division of the ESC.

[4] Steve Rea, "Current Status of Engineering Education in North Carolina," study prepared for Rep. Aaron Fussell (D-Wake), Vice-Chairman, House Education Committee, May 28, 1981.

[5] Chapter 412 of the 1979 Session Laws (HB 874), "An Act to Establish the North Carolina Balanced Growth Policy," April 19, 1979, Section 7 (1).

[6] U.S. Department of Labor, Bureau of Labor Statistics, *Industry Wage Survey: Semiconductors, September 1977* (Washington, D.C.: USGPO, 1979).





MICROELECTRONICS: A Healthy Future for North Carolina?

by Joseph T. Hughes, Jr.

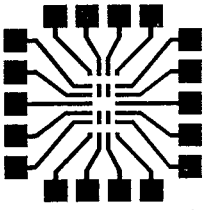
Silicon crystals must go through a complex series of chemical processes to become "chips" – the heart of integrated electrical circuits like the one above.

It is imperative that we think of Southern industry as a spiritual movement and of ourselves as instruments in a Divine plan.

Millhands and Preachers
by Liston Pope

Microelectronics is expected to be the major growth industry for the remainder of the century . . . (the) new industrial revolution.

Microelectronics Center of North Carolina promotion brochure



In the last decades of the 19th century, the South began building what became the cornerstone of the region's economic base for the 20th century: the textile industry. The milltowns springing up across the Piedmont represented a moral crusade whose goal, in the words of one of its major advocates, Henry Grady, was "to lift the South from defeat and utter poverty to victory and plenty." But the promise of steady work overshadowed a hazard of the industry that only became widely understood three generations later: People who work around cotton dust for many years might become sick and disabled in the course of their employment.

As industrial developers and southern boosters approach the year 2000, they are banging the drums of a new crusade – the promise of the microelectronics industry. These advocates have marshalled the same kind of fervor as did their 19th century predecessors. But the industrial promoters of today face another kind of challenge this time around. As the problems associated with brown lung have received increasing attention throughout the textile belt – and as industrially-related health concerns have emerged throughout the country, industrial planners have been forced to recognize another dimension to their trade.

Planning ahead to prevent chronic health prob-

Photo by Chip Henderson, courtesy of N.C. Department of Commerce.

Joseph T. Hughes, Jr., who is completing a master's degree in public health at the University of North Carolina at Chapel Hill, directs the pesticide project of Farmworker Legal Services of North Carolina.

lems at the front end of an industry's development is much less costly to society in the long run than bearing the burden of sickness, suffering, or environmental cleanup in the distant future. As Governor Hunt's toxic substances advisor, Don Huisingh, recently noted regarding the microelectronics industry, "There are questions pertaining to human health effects that we need to explore thoroughly. We want to be able to anticipate what problems there may be . . . before we have dead bodies."

In the last few years, health-related issues – both inside the workplace and in the outside environment – have become a clear concern in formulating state policy on industrial recruitment. Several recent events have brought into question the state's traditional commitment to industrial growth at any price.

- In 1971, the General Assembly passed a bill directing the Department of Commerce, in conjunction with the Department of Natural Resources and Community Development (NRCD), to prepare an environmental impact analysis of prospective industry recruits.[1]
- In 1980, the Governor's office set up the Toxic Substances Project within the North Carolina Board of Science and Technology to evaluate the most frequently used and most dangerous toxic chemicals used in the state and to develop comprehensive profiles of each substance.
- In November 1980, under registration procedures required by the federal Resource Conservation and Recovery Act of 1976, stringent hazardous-waste guidelines went into effect.[2] They significantly increased the cost of disposing of toxic byproducts and sharpened the public's awareness of the need to protect groundwater supplies from chemical contamination.
- In June 1981, the United States Supreme Court, in a decision involving the cotton dust standard under the Occupational Safety and Health Act, rejected the use of cost/benefit analysis for worker health standards. The ruling is forcing a reevaluation of corporate policy with respect to occupational health hazards and use of control technology.[3]
- In 1981, the General Assembly passed the Waste Management Act of 1981, a legislative priority for Governor Hunt which provides the state with mechanisms for dealing with hazardous and low-level radioactive wastes.[4]

[1]G.S. 143B-437, as recodified in 1977.

[2]42 U.S.C. 6901 *et. seq.*

[3]*American Textile Manufacturers Institute, Inc.* v. *Donovan,* 101 S.Ct. 2478 (1981).

[4]Chapter 704 of the 1981 Session Laws (Senate Bill 443).

Measuring the tradeoffs between jobs and the environment has entered the industrial-recruitment equation in North Carolina for the first time. Thus far, the results of this process have tended to pit industrial recruiters against environmentalists or worker advocates.

In 1979, for example, public controversy erupted over a proposed oil refinery on the banks of the Cape Fear River in Wilmington. The Department of Commerce (DOC) hailed the refinery as a great coup for the state and in its 1979 *Annual Report for Economic Development* ranked petroleum at the top of the list of industrial sectors by amount of investment capital committed to North Carolina during that year. Environmental groups joined with local citizens to protest threats to the

Worker Safety and Environmental Considerations

by George R. Herbert

On May 28, 1981, Mr. Herbert presented a "Statement Regarding Requested Budget Appropriations for Microelectronics Center of North Carolina" to the full Joint Appropriations Commitee of the General Assembly (see full text on pages 23-26). The portion of that "Statement" concerning worker and environmental considerations appears below (the table appeared as an appendix to the May 28 testimony).

Processes for the fabrication of integrated circuits involve a variety of chemicals, many of which are used in other industries with which we are more familiar. In general, the quantities used are much smaller than we are accustomed to thinking of when we hear reference to "industrial chemicals." While some of these chemicals require careful handling, integrated circuit production poses no unusual hazards to workers nor to the environment when compared to other major manufacturing sectors.

Chemicals are neutralized and removed from water used in the process, and scrubbers remove undesired vapors from discharged air. As a result, this industry represents no special threat to our environment. And with constantly advancing technology, newer facilities are recycling a high

ecosystem, and state and federal agencies made extensive studies of potential hazards before issuing the required permits. By 1981, the demand for petroleum products had declined significantly from the 1979 peak, and the projected cost of building the refinery had increased from $400 million to $1 billion. Brunswick Energy Co. cancelled its plan to build the refinery, and the "committed" capital of 1979 never got off the books.

The "economic development vs. health and environment" debate has taken a strident turn over microelectronics recruitment as well. Supporters of the industry, such as Microelectronics Center Board Chairman George Herbert, have characterized health advocates as using "scare tactics" and "carefully extracted statistics" to portray employment in microelectronics as "exceptionally hazardous" (see box on this page). Worker advocates, such as the Durham-based North Carolina Occupational Safety and Health Project (NCOSH), have held a "citizens" hearing at which most speakers addressed potential hazards of the industry. While *The Charlotte Observer* and *The News and Observer* of Raleigh have each reported current environmental debates within the industry, neither has done a far-reaching analysis (such as the recent Pulitzer Prize-winning series on brown lung by *The Charlotte Observer*). More importantly, perhaps, no ongoing policy dialogue concerning the potential health hazards of the industry has emerged.

Much of the job-safety and health controversy in the microelectronics recruitment campaign revolves around the semiconductor sector of the industry, the fastest growing branch of the elec-

percentage of their water, thereby reducing even further the amounts of water used and discharged.

For whatever special motives they may have, there are those who use carefully extracted statistics and scare tactics to portray employment in the microelectronics industry as exceptionally hazardous. They do so by extracting from the Department of Labor's report of "occupational injury and illness" only the "illness" rate of 0.9 cases per year per 100 full-time workers in 1978 noting this as being higher than the average for all private industry. They do not explain that the "illness" rate is only a tiny fraction of the total safety data nor that, because the definition of "illness" includes such concerns as skin irritation and eye strain, the "severity rate" for the semiconductor industry, measured by lost work days, is only 80 percent of that for all industry.

In fact, the microelectronics industry has one of the best safety records of all industrial categories, and its 1978 *occupational injury* and illness incidence rate of 6.4 reports per 100 full-time workers was 32 percent lower than the 9.4 rate for all private industry and less than one-half of the 13.1 figure for all manufacturing. (See the table of industries which clearly indicates the excellent comparative safety ranking of the semiconductor industry.)

The only conclusion that can be reached by an objective examination of the nature and record of the microelectronics industry is that it is a responsible industry, that it offers safe careers to its workers, and that North Carolina will benefit from having it among its "industry citizens." Special barriers to its existence or special studies of its operations are no more warranted for this industry than for the other manufacturing industries that are now operating in the state and would only serve to indicate a less than warm welcome.

Occupational Injury and Illness Rates for Selected Industries, U.S. (1978)

(Reports per year per 100 full-time workers)

Mobile Home Manufacturing	34.8
Boat building and repairing	22.8
Poultry and egg processing	22.8
Brick and clay tile	21.2
Malt beverages	19.3
Household furniture	16.5
Dairy products	15.8
Bakery products	13.8
Paper and allied products	13.5
Residential construction	13.3
All manufacturing	**13.2**
Agricultural production	12.8
Household appliances	12.6
Textile machinery	12.2
All private sector	**9.4**
Phosphate fertilizers	8.4
Chemicals and allied products	7.8
Cigarette manufacturing	7.7
Retail trade	7.5
Semiconductors	**6.4**
Engineering and scientific instruments	6.2
Computing equipment	4.4
Banking	1.5

Source: 1978 data from August 1980, report of Bureau of Labor Statistics, U.S. Department of Labor.

REPORT OF OCCUPATIONAL DISEASE for SELECTED INDUSTRY and DISEASE GROUPS IN CALIFORNIA

Percentages are reported incidences of a particular disease group divided by the total number of reported diseases.

Industry Sector	Skin Condition	Eye Condition	Chemical Burns
Electronic Components & Accessories	23.9%	27.1%	34.1%
All Manufacturing	35.8%	33.0%	12.9%

Source: Department of Health Services, State of California, "Tabulation of Reports of Illnesses in California Reported by Physicians," 1976. (This is the latest data available as of July 1981.)

tronic component manufacturing business and the most labor-intensive. This sector, which produces microchips and integrated electronic circuits, involves engraving a complex pattern of electric circuitry on a piece of silicon no larger than a fingernail. After silicon crystals are ground up and sliced into thin wafers using a diamond-edged saw (a process called wafer fabrication), they undergo a multi-staged etching, polishing, and cleaning process. Finally, photographic and electrochemical techniques, called photoresist, are used to impart special electrical characteristics to each individual microchip (see box on page 37 for a technical explanation).

Throughout this formulation process, numerous chemicals, organic solvents, and poisonous gases are used for electroplating, stripping, and degreasing the semiconductor components and the integrated circuit-boards. According to Hamilton Fairburn, assistant regional administrator of Region IX for the Occupational Safety and Health Administration (OSHA), the name "electronics industry" is misleading. "People think of it as wires, soldering and transistors," says Fairburn. "But when you get to the semiconductor industry, you're really talking about chemical reactions. It's a chemical industry."

Because of the growing health concerns about chemical use in the semiconductor sector, the National Institute for Occupational Safety and Health (NIOSH) has recently contracted with the Research Triangle Institute (RTI), based in the Research Triangle Park, to conduct an evaluation of worker health data throughout the industry. According to David A. Pasquini, director of the RTI study, "There are a lot of unanswered questions. I don't think that anybody has any answers yet." A preliminary draft of the RTI study lists a number of potential occupational health hazards in microelectronics including "occupational asthma" from breathing soldering and welding fumes; possible liver inflammations from the solvents carbon tetrachloride and trichloroethylene (TCE), both of which are suspected as cancer-causing agents; and unspecified health problems from exposure to ozone, arsine, and phosphine gases.

In 1978, the semiconductor industry had overall job-related illness and injury rates 50 percent lower than the all-manufacturing average, according to the U.S. Department of Labor. However, the number and severity of work-related illnesses, including occupational diseases, were much higher than average during the same year according to the California Department of Industrial Relations. The California data indicate, for example, that the semiconductor industry had an incidence rate in job-related *illnesses* four times higher than the rate in all employment sectors and two and one-half times higher than the all-manufacturing average.

Defenders of the microelectronics industry dispute the importance of the job-illness rate. Mr. Herbert, for example, says it represents only "a tiny fraction of the total safety data" and that it is inflated by minor irritations such as skin rashes and eye strains (see Herbert box). However, the proportion of skin and eye problems, as a percent of all reported illnesses, are lower in microelectronics than for all manufacturing sectors – 23.9

North Carolina Occupational Safety and Health Project (NCOSH) Director David Austin gives presentation at June 30 hearing on microelectronics.

Photo by Paul Cooper

and 27.1 percent respectively, compared to 35.8 and 33.0 percent. Hence, these problems could not have inflated the job-illness rate in microelectronics. But the proportion of chemical burns requiring medical attention, a more serious concern in the illness data, was more than two and one-half times higher than for the all-manufacturing average – 34.1 percent compared to 12.9 percent (see box on page 36). The source of these figures, the California Physicians' Occupational Illness Report,

What is a Silicon Chip?

by Tom Vass

Nearly all chips of microelectronic circuits are made on a wafer of silicon, a metallic element a little lighter than aluminum with a silvery luster. These chips are assembled into tiny electrical circuits which form the backbone of the computer systems in microwave ovens, calculators, computer memories, and thousands of other products. Microelectronic chips have a crystal structure whose atomic bonds allow the conduction of current by either positive or negative carriers when the proper dopants (chemicals) are added. The steps in the manufacturing processes of a chip are listed below, in a simplified way.

1) Chemically altering a purified form of sand called "ferro-grade" silicon produces high-quality polycrystalline silicon.

2) From this substance a single crystal seed, the size of a pea, is immersed in an oven at 1,400°C in a mixture of molten silicon dopants. The crystal seed is rotated and withdrawn continuously, allowing the mixture to solidify on the seed's surface, reproducing the atomic structure of the crystals.

3) When the single crystal approaches a manageable size, it is ground into a cylinder out of which thin, circular wafers three to five inches in diameter are cut. Each wafer is submerged in an acid bath to remove any extraneous substances left from the cutting procedure. The acid is heated to increase its cleaning ability. After the acid bath, the wafers are alternately rinsed in cold and then boiling water.

4) In a process called "photoresist/baking," the wafers are baked at 1,100°C in order to produce a thin upper layer of silicon oxide. A coating of light-sensitive chemicals is put on the layer of silicon oxide and the wafer is baked again.

5) The wafer is then exposed to a pattern of integrated circuitry by passing ultraviolet light through a glass mask, a process called "masking." The ultraviolet light leaves a pattern of the desired circuit on the wafer which is then baked at high temperatures.

6) After the pattern has hardened, the wafer is dipped in boiling sulphuric acid to remove materials from around the pattern and then rinsed. At this stage, the wafer is referred to as an "etched wafer."

7) The etched wafer is placed in a diffusion furnace containing either arsine, phosphine, or boron gas and heated to 1,000°C. The chemical gases, called dopants, enter the exposed areas of the circuit pattern, altering the atomic electrical characteristics of the silicon.

8) If more layers of circuitry are required on the wafer, the stages explained in numbers 4-7 are repeated.

9) Once the wafer has the required layers with complete circuitry imprints, it receives one more round of masking with photoresist chemicals and is masked with a thin layer of aluminum to define electrical contacts for connecting external wiring. The wafer is placed in an evaporation oven to rid it of unwanted metal traces, then coated with a layer of glass at a temperature of 420°C.

10) The finished wafer is etched with acid and rinsed with water. It is cut into individual chips, usually with a diamond saw. From this point, the chips can be bonded to ceramic frames and assembled into integrated circuit boards.

Process	Chemicals Used
Wafer Production	silicon, hydrogen
Wafer Cleaning	sulphuric acid (heated), nitric acid
Photoresist/Baking	xylene (1,000°C), hydrogen
Masking	none
Etching	hydrofluoric acid (heated), hydrochloric acid
Diffusion/Baking	arsine gas, or phosphine gas, or diborane gas (1,000°C)
Metal Masking	same as processes 3-6
Wafer Cutting	none
Assembly Into Boards	cyanide, epoxy resins, krypton gas, lead, trichloroethylene, freon, acetone, alcohol, solvents

Tom Vass is a member of the Conservation Council of N.C.

published by the state's Department of Health Services, is the only mandatory state-reporting system on worker health problems in the country.

In addition to potential worker hazards, the industry poses possible environmental threats. The concentrated use of chemicals may, for example, exacerbate the growing problem in the state of proper hazardous waste disposal. Even in California, which has state-approved hazardous waste disposal sites, semiconductor wastes continue to be improperly dumped into sewers and sanitary landfills, according to reports by *The Charlotte Observer.* Dr. David Storm, regional head of the California agency that manages hazardous wastes, said that Santa Clara County, the heart of silicon valley, produced 1,849 tons of toxic wastes in April 1980 (the most recent month for which statistics are available), 80-90 percent of which came from the 500 electronics plants in the county.

North Carolina currently does not have any approved sites for disposing of toxic wastes properly. Most of the state's wastes are either stored in drums or holding ponds on company property or, at large expense, shipped out of state to waste sites approved by the Environmental Protection Agency. North Carolina recently had its first known contamination of groundwater with toxic waste from a semiconductor operation when International Business Machines (IBM) revealed that chemical wastes from its Research Triangle Park facility began seeping into the water table three years ago. IBM generates approximately one million gallons of toxic wastes each year, 30 percent of which result from its semiconductor operations, according to a company spokesman.

The toxic waste problem for microelectonics producers may become even more acute in the near future, particularly in the Research Triangle area, with the opening of semiconductor plants by Raychem in Fuquay-Varina, Data General in Apex, and Hewlett-Packard in Wake Forest. In California's silicon valley, according to Dr. Storm, "The electronics industry wastes are not so great by volume, but they are some of the more nasty types."

The industrial revolution of the 21st century rolled symbolically into North Carolina in the spring of 1981 when the General Assembly approved $24.4 million for the Microelectronics Center of North Carolina (MCNC). Whether we will have microelectronics is now a moot question. Even before the MCNC appropriation, the electronics industry was the fourth largest industrial employer in the state, rapidly moving up on textiles, apparel, and furniture in terms of economic investment, number of employees, and, with the establishment of the MCNC, political clout. The question now becomes: How can state policymakers plan so as to understand and manage the potential threats which the microelectronics industry pose to the state's natural and human resources?

During the debates on the appropriation for MCNC, several citizen groups proposed mechanisms to research and explore the environmental and occupational health questions concerning the microelectronics industry. The Conservation Council of North Carolina suggested that a portion of the MCNC appropriation be earmarked for research into safe use of known toxic substances in the industry. In addition, NCOSH proposed the development of an environmental/occupational health advisory committee to MCNC to ensure ongoing input from a variety of persons with scientific backgrounds and to facilitate continued monitoring of the industry in its quest to control its chemical problems. But in the heat of legislative battle, no action on such a touchy topic was taken.

The influx of microelectronics firms represents a unique challenge to North Carolina policy planners and regulators. The potential hazards and harmful effects of the industry are still shrouded in scientific differences of opinion and uncertainty. Moreover, the 1980s appear to be a period of deregulation, cutbacks in funding of regulatory agencies, and a return of enforcement and monitoring responsibilities to the states. Consequently, state agencies such as the Departments of Labor and Human Resources, which now have the primary responsibility for protecting workers' health and monitoring toxic waste in the environment, will have to take major leadership roles in coping with scientific uncertainties and regulatory standards.

While this shift in responsibility from the federal to the state level poses a serious challenge, it also represents an opportunity for far-sighted North Carolina officials. If potential threats of the microelectronics industry to health and the environment are anticipated and examined seriously – not glossed over or dismissed as alarmist – the advent of the industry to North Carolina could provide a demonstration project for the nation. An economic development policy guided by sound, open-minded planning rather than excessive boosterism can not only net new jobs but also nurture good health. Only then will an important lesson from the industrial crusade of the 19th century be incorporated into the "new industrial revolution" of today. The health of workers and the protection of the environment must be considered in charting a major new course in economic development. □

Planning for the Boom at the Local Level

by William Brazeale and John G. Scott

In March 1981, eight government officials from the City of Raleigh and Wake County spent nearly a week in the Santa Clara Valley of California, the area between San Francisco and San Jose that has become known as "silicon valley." They interviewed a wide range of government and industry officials to learn how the microelectronics "boom" in that area during the last 20 years has affected local services. "If mistakes were made there, how can we avoid making the same mistakes here?" asked William Brazeale and John G. Scott, authors of "Report on a Visit by Officials."[1]

Much of the report summarizes recent developments in silicon valley and describes how, in many cases, services within both the public and private sectors came to be underfinanced and overburdened. After reviewing the California experience, the report addresses specific concerns for Raleigh and Wake County officials and citizens to consider. The excerpts from the report below provide an important dimension to the public policy discussions concerning the influx of the microelectronics industry into North Carolina.[2] *Moreover, they illustrate how one locality is attempting to plan for a rapid expansion of industrial development, a process that is taking place in more and more parts of North Carolina.*

Wake County Planning Director John Scott (left) and an assistant examining maps in their Wake County Courthouse office.

William Brazeale is assistant planning director, city of Raleigh. John G. Scott is director of planning, Wake County. Photos by Paul Cooper.

[1]William Brazeale and John G. Scott, "Report on a Visit by Officials of the City of Raleigh and the County of Wake, North Carolina to the Santa Clara Valley, California," May 4, 1981. Limited copies of this report are available from the Wake County Planning Office.

[2]These excerpts come from the report's "Conclusions" section, pp. 23-34.

Microelectronics and associated development turned silicon valley into one of the most affluent regions in the nation for the private sector. But the public sector has not fared nearly as well. Although a few of the communities – notably Santa Clara – appear to have managed well enough, others are hard pressed to provide public works and services fast enough to catch up with the boom, let alone get ahead of it. There are serious problems with solid and liquid waste disposal, the transportation system, fire protection, increasing crime rates and the beginning of slums. Air pollution from heavy traffic is a problem some of the time.

Those in the private sector have concentrated on "their thing," perfecting new devices for which there is great demand, supplying materials to manufacturers, training scientists, building, buying,

How to Use the Land

The recommendations below on land use planning are excerpted from "Comments by Mr. William Brazeale, City of Raleigh Planning Department," Appendix C of the "Report on a Visit by Officials" (see footnote 1 in main article for full citation).

The major problems encountered by Santa Clara County are common to areas experiencing rapid growth. Fragmentation of decision making in Santa Clara County gave rise to: 1) an overall inefficient land use pattern; 2) a tendency to delay decisions on public improvements or attempts to transfer the costs of development to other jurisdictions.

Dispersion – clustering of growth.

Continuation of dispersion of job sites throughout Wake County, located in close proximity to housing, will help to avoid the massive one way commuting that occurs in Santa Clara. In addition, major job centers should be clustered within or close to existing municipalities such that:

- Existing urban facilities such as parks, schools, and fire stations can be utilized;
- Where necessary, urban services can be incrementally expanded to provide for both industrial and new residential developments. Public improvements such as streets which are constructed during development become much more efficiently utiiized if rapid urbanization concentrates in the same vicinity.
- Competition among municipalities for tax base expansion into developing areas far beyond existing corporate limits can be avoided.

Development regulations.

Development regulations should be responsive to the changing character of the high technology industries, and help provide incentives for higher density housing that will be needed in the future.

One solution to help relieve the housing shortage in Santa Clara County is to increase housing densities near employment centers. However, rezoning scarce vacant land to higher densities has proved difficult due to the citizen opposition. To avoid the same problem in Wake County, mechanisms should be established to assure that as the demand for high density housing increases, adequate amounts of properly zoned property will be available, especially near employment centers. Similarly, there should be adequate nonresidential zones within each municipal jurisdiction to assure enough available sites for industrial growth. Zoning regulations should be tailored to high quality, indoor oriented fabrication facilities that are characteristic of the semiconductor industry. Regulations should also take into account the potential dramatic increase in the number of employees over short periods of time that could occupy such facilities.

Forecasting and monitoring of growth.

Coordination with existing and proposed industries to accurately monitor employee growth plans is important to provide adequate lead time to construct needed public improvements for the projected population growth. There was a lack of precise techniques to monitor the changing character of semiconductor industries in Santa Clara County during the rapid expansion in the 1970s.

Provision of services outside municipal jurisdictions.

The concept of at least temporarily preserving open space/farm land and restricting urban growth to logical increments within such boundaries was accomplished in Santa Clara County by: 1) the limitation of public utility extensions

or selling . . . . Local government officials in silicon valley were not accustomed to systematic intergovernmental coordination or close coordination with industry and were not disposed to give planning high priority in policy, administrative, or operational affairs. Generally they zeroed in on the excitement and economic benefits of enormous growth in the private sector, and overlooked or underestimated effects in the public sector. Consequently, serious problems have developed.

How can Wake County avoid growth pains and undesirable consequences?

Since land is literally at the bottom of the infrastructure, a general land use plan should be prepared and adopted . . . . It is questionable whether we have really considered broad purposes

Planning for transportation needs involves careful attention to job and home density patterns.

and connections to areas within urban growth boundaries; and 2) the restriction of lot sizes in the rural or transition areas to 20 or 160 acre minimums.

Unless similar restrictions on urban development are instituted in Wake County, there will continue to be suburban scale development beyond the jurisdictions of cities and towns. Similarly, if major job centers, such as the area surrounding the airport, begin to develop outside the jurisdiction of Wake County towns, provisions must be made for adequate services to such areas, especially regarding transportation facilities for commuters from residential neighborhoods elsewhere.

Transportation.

Thus, it is important that the rate of development not outdistance the availability of adequate roads to serve commuters in the private automobile. The scale and density of employment clusters in Wake County should be monitored to assure that traffic generated is commensurate with road capacities. Improvements should be made in the same time frame as development occurs. Provisions should be made to assure future construction of major thoroughfares connecting job clusters and residential areas.

- Scatter employment centers in clusters throughout the County to make more efficient use of roads by helping to more evenly distribute peak hour commuters in several directions.
- Surround employment clusters with high density housing to give workers the opportunity to locate close to their jobs, and to commute over local collectors or minor thoroughfares, rather than relying solely on freeways.

"Disperse places of employment and surround them with residences."

— recommendation from Silicon Valley

other than the habitual, reflexive desire to "grow and develop" and "add to the tax base." We observed that the billions of dollars added to tax bases in silicon valley somehow didn't solve local government problems; however, at least one city did adopt a macro-plan fifteen years ago and abided by it "pretty accurately." Officials of that city reported that they're in good shape financially.

Silicon valley people recommended repeatedly that we avoid overly concentrated industry: "Disperse places of employment and surround them with residences." In other words, don't repeat their mistakes. Another silicon valley advisement was that local governments work together as actively and cooperatively as possible. Too much provincialism can stifle what is best for the greater metropolitan area. State and local governments should coordinate their efforts and goals, and working partnerships between industry and local government should be established to affect [sic] mutual aid. The Santa Clara County Manufacturing Group was established for just those purposes.

Those recommendations are certainly acceptable, and we note that significant steps along those lines have already been taken here – for example, regional councils of government, city-county liaison committees,* the proposed State Balanced Growth Policy. Those efforts could and should be improved. In regard to state-local and industry-government cooperation, a snag appears in the form of a need to protect confidentiality in some instances. State agencies go industry hunting. There's a right time and a wrong time to let governments know about prospects, but local governments should be consulted as soon as possible.

The same type of problem arises in industrial liaison. The idea is for employers to keep in touch with local governing bodies, tell them about expansion plans, changes in the work force, changes in processes that might affect public facilities, etc. Corporations may be understandably reluctant to expose some of such plans. One way to overcome the confidentiality aspect was found in California. A certified public accountant was retained to obtain informtion from the companies and to release it to local officials without disclosure of sources. Industries were willing to cooperate on that basis. Something similar might be done in Wake County. Among other things we need to know where employees live, especially when a new industry has hired a work force.□

A General Electric microelectronics facility under construction in the Research Triangle Park.

*The Wake County committee is now developing a county-wide planning process.

Hewlett-Packard Comes to Wake County

In 1938, Bill Hewlett and David Packard opened up shop in a Palo Alto, California, garage in the shadows of Stanford University. Their company quickly outgrew that location in the early days of the micro-technology expansion and by 1980 Hewlett-Packard was the nation's ninth largest electronics company with over $3 billion in annual sales. California's silicon valley was no longer big enough to contain the company's boom.

In February 1980, Hewlett-Packard spent $1.7 million for a 240-acre tract in the sprawling Wakefield Farm Industrial Park, near the town of Wake Forest in northern Wake County. When complete, the Hewlett-Packard facility will be among the largest employers in the Triangle area.

Hewlett-Packard officials fondly refer to their plants as "campuses" and indeed they should. Thirteen interlocking buildings of some 2.3 million square feet will spread across 26 acres. Over four times that area will be devoted to recreational purposes – a lake, a softball field, a jogging course, complete gym facilities, and more. Employees will be encouraged to stay after work and enjoy these amenities with their families.

The Triangle area attracted company officials because of reliable electricity sources and the complex of universities nearby. Well before the Microelectronics Center of North Carolina was on the map, Hewlett-Packard contacted the state in search of a plant site. The company chose the Wakefield Farm location because the topography of the area can accomodate the buildings' multi-tier design. Travelers on nearby roadways will not be aware of the modernistic architecture since the plant will be secluded from view behind hills and woodlands.

While no lure as large as a $24 million state-funded Microelectronics Center was necessary to land Hewlett-Packard, some amenities at the local level did provide assistance to the company. The Wake County Board of Commissioners voted to spend $2.5 million to expand water lines to the Wakefield Farm Park – and hope to regain the investment in an expanded property tax base.* The town of Wake Forest does not currently have adequate sewage facilities to meet the industrial park's needs, so North Hills, Inc., the developer of the park, is building its own 2 million gallon a day treatment plant. North Hills, Inc. says that it doesn't want to be in the waste treatment business and that Wake Forest might purchase the treatment facility when in full operation.

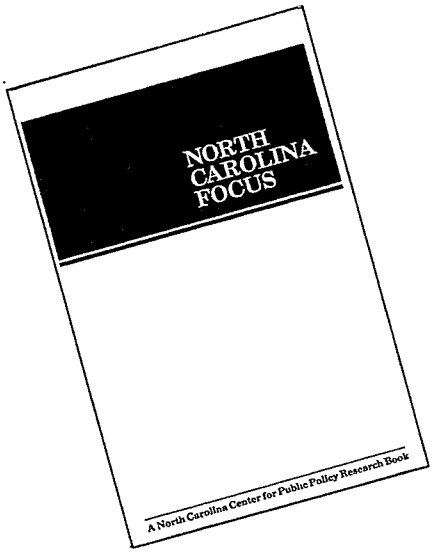
The Wakefield Farm plant will be a microcosm of the Hewlett-Packard organization. When Hewlett-Packard develops a new site it includes all phases of its production process, from high technology research and development to component assembly. Employees will include top-level management, Ph.D. research scientists, skilled technicians, and semi-skilled and unskilled production workers. Ultimately, 10,000 people will be employed, and supposedly, most will be drawn from the local labor market.

Microelectronic chip production is only a minor aspect of Hewlett-Packard's total operation. The Wake County facility will use most of the chips it makes to produce chemical analysis equipment used by the Environmental Protection Agency (EPA) to monitor pollution. As a major supplier to the EPA, Hewlett-Packard has a built-in sensitivity to compliance with various environmental standards, often tested with its own products.

If all of this sounds enticing, do not quit your job to seek employment with Hewlett-Packard just yet. They will not be in full production until the 21st century. □

Glenn Kiger, a graduate student in the Institute of Policy Sciences and Public Affairs at Duke University, worked on the Triangle J Council of Governments microelectronics study as an intern there during the summer 1981.

*This implements part of the county-wide water distribution system plan that was adopted in the early 1970s. The system goes past this industrial park on to Wake Forest.



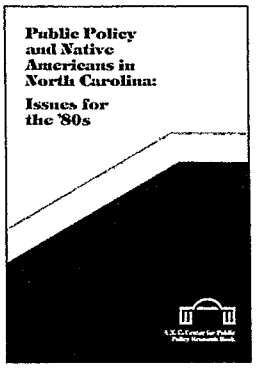
- Ideal for students of state & local gov't.
- Can be used as a college text.
- Organized like the N. C. Constitution.
- $4.95 per copy

TABLE OF CONTENTS

Teacher Certification:

Out-of-field Teaching in Grades 7-12

- assesses the prevalence of out-of-field teaching in math, science, English, foreign languages, reading, social studies, physical education, and health in grades 7-12
- reviews past state policy on teacher certification and out-of-field teaching
- examines proposed state guidelines and policies designed to decrease the incidence of out-of-field teaching in the public schools
- recommends policy changes to improve the quality of education in the public schools
- $2.50 per copy



The Center's conference on "Public Policy and Native Americans in North Carolina: Issue for the '80s" examined many of the problems facing native Americans in North Carolina in the areas of education, health, economic status and recognition, and suggests remedial actions for some of the most pressing problems. This document reports the proceedings of that conference. NO CHARGE

To order these publications, please use the insert card found in this issue.

FROM THE CENTER OUT

In June, the Center released the first product of an 18-month study of changes in the tobacco economy in a thematic issue of N.C. Insight. *Called "Tobacco in Transition," this collection of articles came on the heels of a vigorous debate in Congress over the federal tobacco program – a debate scheduled to be renewed during the early fall when the Omnibus Farm Bill of 1981 reaches the floor of the U.S. House of Representatives.*

The Center has distributed over 3,500 copies of the magazine to farm groups, agricultural extension agents, farmers, politicians, editors, administrators, and scores of other interested citizens. Requests for more copies have also come from North Carolina Congressman Charles Whitley's office, the staff of the U.S. Senate Agriculture Committee, the South Carolina Farm Bureau, the Flue-Cured Tobacco Stabilization Corporation, the Wilson (N.C.) Tobacco Board of Trade, Legal Services of North Carolina, and others.

Meanwhile, editors and reporters across the state, from The News and Observer *in the capital city to rural weeklies, have used the issue for columns and news stories. "For provocative reading, turn the leaves of the current issue of* North Carolina Insight," *writes Lois Byrd in the June 30 issue of the* Sanford Herald. *"The fact that new ideas are advanced, and some not too popular, is one of the best reasons for reading this issue." Or see the August 6 edition of the Roxboro* Courier Times, *where University of North Carolina Journalism Professor Walter Spearman headlines his column, "If not tobacco, then What?" "This is the question explored in depth in the current issue of* N.C. Insight," *writes Spearman.*

In September, the Center will release the second product of the tobacco study, a 30-chapter anthology from which much of the magazine issue was excerpted; it is titled The Tobacco Industry in Transition: Policies for the 1980s. *The first book produced by the Center through a national publishing house (Lexington Books), it promises to receive wide attention as well.*

Below are a few of the letters we have received on our tobacco project.

Tobacco in Transition

Thank you for sending me several copies of the most recent issue of *North Carolina Insight*, "Tobacco in Transition." This issue is especially timely, and I am sure that as Congress continues to study tobacco issues and programs it will prove to be a valuable resource tool.

Sincerely,
Ike Andrews
Member of Congress
4th District, North Carolina

I want to commend you on the recent issue of *N.C. Insight* entitled "Tobacco in Transition." Your discussions of the issues were both objective and comprehensive. They will add to an understanding of the current situation facing this industry – some of its problems, the alternatives available and the consequences of those alternatives. Eventually, of course, this is the basis on which decisions and compromises will be made. Your publication has made a significant contribution.

Sincerely,
T.C. Blalock
Agricultural Extension Service
North Carolina State University

Your issue "Tobacco in Transition" is clearly one of the most valuable assessments available on the subject of tobacco agriculture. Those of us who are interested in tobacco must continue to look for ways to improve the Tobacco Program, to make it more relevant to producers and the others associated with this important industry. "Tobacco in Transition" will provide a vehicle for discussing tobacco that will have . . . [an effect] . . . for many years to come.

Sincerely,
Joseph A. Kinney
Staff Director
Committee on Agriculture
National Governor's Association

N.C. Center for Public Policy Research
P.O. Box 430
Raleigh, North Carolina 27602

Nonprofit Org.
U.S. POSTAGE
PAID
Raleigh, N.C.
Permit No. 1121