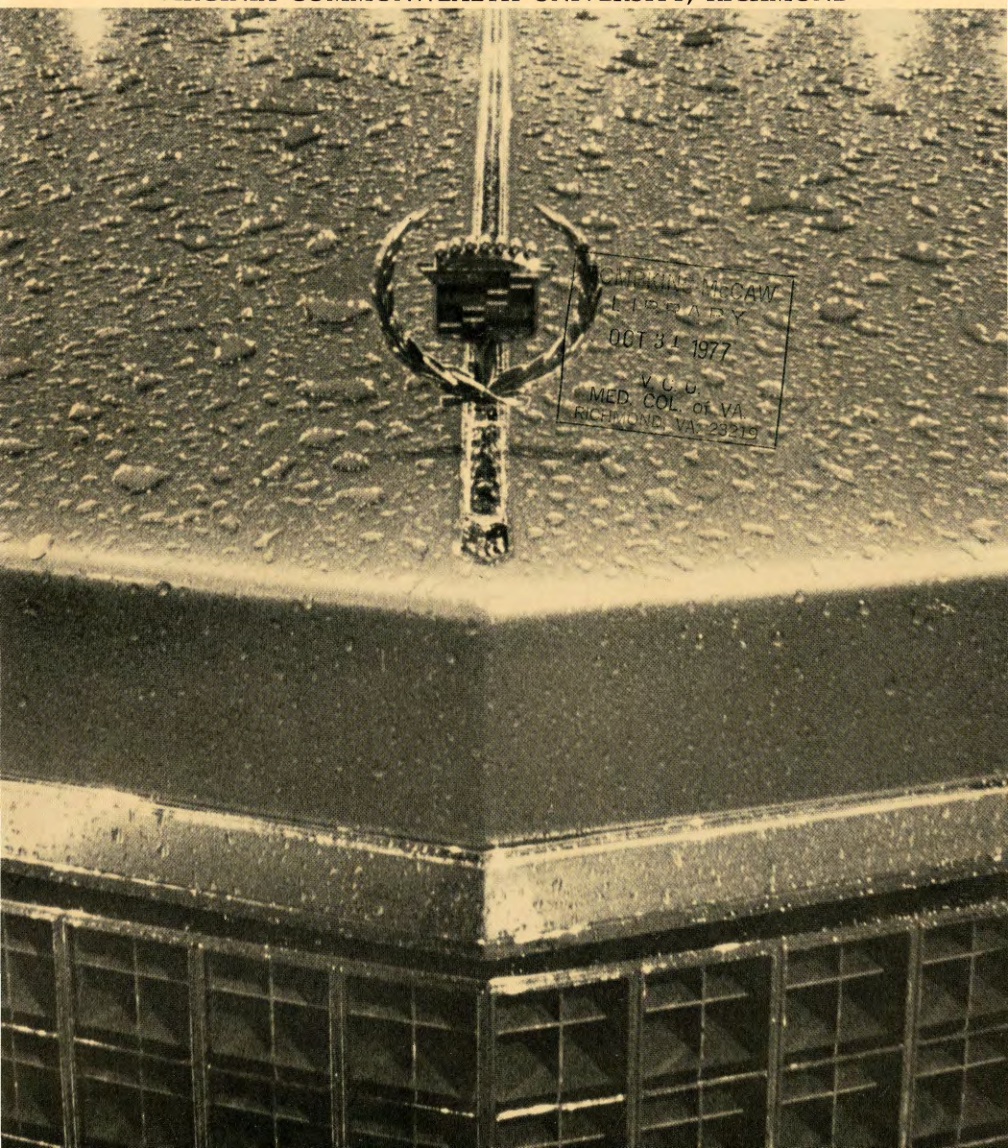
Summer 1977

Research in Action

VIRGINIA COMMONWEALTH UNIVERSITY, RICHMOND





Research in Action

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A publication devoted to describing the scholarly and creative activities of the university community.

Each issue of *Research in Action* describes only a few of the many research projects being conducted at Virginia Commonwealth University. Specific comments on the featured projects should be directed to VCU's Office of Research and Graduate Studies. The opinions expressed in *Research in Action* are those of the author of the particular article based on research and are not necessarily those of Virginia Commonwealth University.

Located in Virginia's capital city, Richmond, VCU is the result of a 1968 merger of the Medical College of Virginia and Richmond Professional Institute. The 1838 founding date is taken from the former. The university is state-supported and enrolls over 18,000 students on its two downtown campuses. Fifteen doctoral programs are offered as are three first professional doctoral degrees, these in addition to 52 master's and 66 bachelor's degrees.

Calendar year 1976 brought good news in research at VCU. For the first time in its brief history, the university has exceeded the $16 million mark in receipt of funds for grants and contracts awarded by external agencies.

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Thinking small for different reasons

The future relationship between the automobile and energy usage is a function of several interrelated variables. These include the number of automobiles, the number of miles traveled each year, and the distribution of sales between smaller, more fuel efficient cars, and larger less fuel efficient cars. It is this last factor which is the focus of research efforts by two VCU faculty members, Dr. George Hoffer, associate professor of economics, and Dr. James Wetzel, assistant professor of economics.

By George Hoffer
and James Wetzel

For generations the automobile has occupied a special place in the hearts and minds of the American public. The automobile not only provides us with transportation but also provides many with a symbol of status or a means of self-expression, be that vehicle a Rolls-Royce or a custom-decaled van.

In addition to the special place in our hearts and minds, the auto also occupies a special place in our pocketbook. For many, the automobile represents their largest single expenditure. For others it ranks only behind that of a home. In recent years we've also become painfully aware of the critical role the auto plays in this country's economy. Although estimates vary, a commonly accepted figure is that one out of every five jobs is related to the automobile or its use. More recently the automobile has occupied another and somewhat different role in our society. Our increasing urban-suburbanization, wealth, and the accompanying increase in automobile usage have created environmental problems. Finally, the relationship between the automobile, its use, and our growing dependence on foreign petroleum has become a national issue.

If the American public shifts to buying VW Rabbits and Hondas with their high miles per gallon figures, the effect on overall gasoline use is going to be rather different than if they buy even the downsized larger domestic cars. One might assume that this last question would have been critically analyzed within the auto industry itself. In recent years however, total sales have often not matched production plans and the distribution of sales has been inconsistent with expectations. The small car rebate programs which we have seen in the post-embargo period are testament to this imbalance between expected and actual sales.

Historically most studies of automobile demand have attempted to explain annual total sales or the sales patterns of individual manufacturers. The focus of this study has been somewhat different. It examines the question of marketshares held by different size categories. By relying on quarterly data, rather than annual observations used in previous studies, the model can analyze intramodel year shifts in sales and marketshares.

This type of analysis also facilitates the examination of the effect of several recent events on marketshares. The first is the significant increase in gasoline prices that occurred in the middle of the decade. Secondly, the effect the large auto price increases have had on marketshare can be analyzed. In addition, the effects that advertising expenditures, styling changes, and model availability have on marketshare can be investigated.

For the purpose of the study the auto industry was divided into four distinct market size categories, with a fifth category used for cars which did not conform well to the categories. The four basic categories were standards, intermediates, compacts, and imports. The marketshares for these four categories are shown in the first four columns of the table. For the purpose of analyzing these markets were summed into two broad categories: big cars (standards and intermediates) and small cars (compacts, subcompacts, imports, and compact specialties).

The Last Ten Years—How Marketshares Have Changed

Before considering the causes of marketshare shifts over the last ten years, look at the table. The two far right columns demonstrate clearly that larger cars have been declining over the entire time frame of the study,


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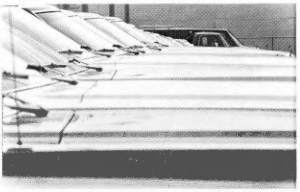


dropping from over 80 percent of the market to about 50 percent. This drop has been at the expense of the standard-size car. The intermediate share of the market has increased from 24 percent in 1967 to 28 percent in 1976 while during the same interval, the standard share has dropped from 59 percent to 21 percent. The slight increase in standard marketshares in the last several quarters probably reflects some anticipatory buying in light of the 1977 General Motors downsizing.

The overall small car marketshare jumped from 17 percent in 1967.2 to 51 percent in 1976.3. This increased small car market penetration is the result of stronger performances by both foreign cars and the United States compacts. This shift has been occurring since before the OPEC embargo and the subsequent price increases in gasoline. Thus the size distribution of auto sales has been changing since the early 1960's. The much advertised downsizing of the 1977 GM cars had been part of company policy since 1972 although, after the events of fall 1973, GM altered their plans so that the cars were downsized more than originally planned. It is interesting to note that while the GM standard car downsizing has received the most publicity recently, there has been no new standard-size car line introduced over the last decade. But during this same interval there have been over a score of non-standard size new lines introduced. Thus, raw data in the table suggests that gasoline prices probably have not played much of a role in the movement from big to small cars. What, then, has caused this shift?

The Changing Composition of the Auto Market Factors Influencing Marketshares

In order to analyze this question, data were gathered on a number of variables that would appear to be important determinants of marketshares by size category. These factors were then incorporated into an econometric model to test statistically which factors were significant determinants of the observed changing marketshare patterns. Factors that were not significant included used car prices, number of models available (In fact, contrary to popular belief about the ability of the auto companies to force their will on the buying public, it appears that model availability follows rather than leads sales), styling changes, promotional expenditures, and supply constraints such as strikes.

Before discussing the factors that have influenced marketshares, several points should be made simply because they are not commonly recognized. Despite the recent increases in gasoline prices, the real price of gasoline has been relatively constant over the last decade, increasing at about the same rate as the major price indicies. New car prices, which have increased considerably in absolute dollars, have increased at a slower rate than the same price indicies. In a relative sense, both gasoline and new cars have become cheaper over the last decade. Consequently, one is not surprised to see that most new cars, including the small ones, are sold heavily laden with extra equipment.

What then determines what size cars people are buying? Unfortunately for Detroit, the most statistically significant factors influencing marketshares are variables over which the manufacturers have little control, namely measures of economic activity. Two measures of economic activity were used in the analysis: 1) the personal disposable income (roughly one's take-home pay) and 2) the index of consumer sentiment, a more subjective measure developed at the University of Michigan Survey Research Center. The latter reflects consumer confidence in the economy and is based on consumers' evaluation of such factors as government policies, changes in energy prices, and even the weather.

The results indicated a positive relationship between increased consumer confidence and the marketshare captured by big cars. However, there was an inverse or negative relationship between income and the marketshares held by big cars. These apparently self contradictory results may be explained by several factors. As overall income falls, total demand for all cars declines. However, since the corporate and institutional sectors of the economy buy a higher proportion of big cars and since these sectors are less sensitive to declines in income, they continue to buy big cars causing big car marketshares to increase with decrease in income. Another factor underlying this pattern relates to the multi-car household. As overtime incomes

have increased and as new labor force entrants (such as middle and upper income class working wives) have entered the car market, there has been an increase in the number of multi-car families. To the extent that multi-car households have a higher mix of smaller vehicles, an increasing proportion of new car purchases will be smaller vehicles until a new equilibrium distribution size mix is reached.

Another important determinant has been the seasonal factor. In the first quarter of each model year (the fourth quarter of the calendar year), the standard size models gain at the expense of smaller cars. This reflects the fact that fleet buyers and high income yearly traders tend to buy a greater percentage of big cars and their buying is relatively concentrated in the first part of the new model year.

The price distribution of new cars has had little influence on marketshares, reflecting that auto prices generally move very tightly together. Except for the rebate period, when the auto companies were trying to unload their small cars and for import price changes which reflected currency revaluations, the pricing structure among the four categories has been relatively unchanged over the time period of this study.

Over the last decade, the price of gasoline has been related to the marketshare held by the two extreme segments, standards and compacts. Whenever gasoline prices changed, compact marketshares moved directly with the price change, while standard marketshares were inversely related. This relationship was short-lived, for when gasoline prices lagged one quarter, they had no impact. Thus over the last decade, gasoline price levels have had minimal and transitory effect on marketshares.

Implications

Several implications can be drawn from this analysis. First, the increased marketshare enjoyed by smaller cars has been a long term phenomenon rather than a recent event. Increasing incomes, new labor force entrants, and the advent of the multi-car household explain most of this trend toward smaller cars. The significant increases in the price of motor fuels has had a minimal effect on small car marketshare with any impact of higher petroleum prices showing up in the period of the price change and dissipating quickly thereafter. While the consumption of gasoline may decline in the long run because of a shift in demand to smaller cars, this shift has been only marginally affected by increased petroleum prices.

Secondly, in the post-embargo period, increasing petroleum prices have impacted on the marketshares of the largest size cars. While the price of gasoline had little discernible impact on standard and intermediate size marketshares during the pre-embargo period, gasoline prices have become significant recently. As petroleum prices have increased, standard size marketshare has declined. The chief beneficiary of this decline in standard marketshares has been the intermediate market. For as petroleum prices have increased recently, so has the intermediate share of the market.

Third, the current Detroit rhetoric about the cost of achieving the government mandated fuel economy requirements is overdone. The market has been moving toward smaller, more fuel efficient cars for a number of years. Thus, even in the absence of government regulation, competitive pressures would force the industry into extensive and expensive retooling. A cynic might argue that the current rhetoric reflects two factors: the auto manufacturers hope to trade the costs incurred in meeting the mandated motor fuel requirements for relaxed environmental air pollution standards, and to a lesser extent, the rhetoric may be in response to fundamental changes the auto industry is currently undergoing.

There is no question that GM is significantly ahead of the other domestic manufacturers in product repositioning. GM's current domestic market penetrations bear testament to its success. Current sales statistics not to the contrary, the remaining domestic manufacturers are in less than a competitive position. Firms that find themselves in trouble in the marketplace have had a proclivity to turn to the government. Such help is more likely forthcoming if Congress can be convinced that one's market predicament is not of one's own doing, but rather because of government interference.

TABLE

Automobile Marketshares by Size Class
1967.2 to 1976.3

Time Period	Import	Compact	Intermediate	Standard	Small	Big
1967.2	0.09	0.08	0.24	0.59	0.17	0.83
67.3	0.12	0.08	0.25	0.54	0.20	0.80
67.4	0.12	0.09	0.25	0.54	0.21	0.79
1968.1	0.11	0.07	0.26	0.56	0.18	0.82
68.2	0.11	0.08	0.29	0.52	0.19	0.81
68.3	0.12	0.09	0.30	0.49	0.21	0.79
68.4	0.12	0.07	0.24	0.56	0.19	0.81
1969.1	0.10	0.08	0.26	0.56	0.18	0.82
69.2	0.12	0.10	0.28	0.50	0.22	0.78
69.3	0.13	0.12	0.26	0.49	0.26	0.74
69.4	0.14	0.12	0.22	0.53	0.25	0.75
1970.1	0.14	0.14	0.24	0.48	0.28	0.72
70.2	0.14	0.16	0.25	0.44	0.31	0.69
70.3	0.17	0.15	0.27	0.40	0.33	0.67
70.4	0.19	0.11	0.21	0.43	0.36	0.64
1971.1	0.17	0.11	0.20	0.44	0.36	0.64
71.2	0.16	0.13	0.22	0.42	0.36	0.64
71.3	0.17	0.13	0.21	0.40	0.38	0.62
71.4	0.13	0.11	0.22	0.46	0.33	0.67
1972.1	0.15	0.12	0.23	0.42	0.35	0.65
72.2	0.15	0.13	0.25	0.38	0.36	0.64
72.3	0.17	0.13	0.22	0.39	0.39	0.61
72.4	0.15	0.12	0.21	0.42	0.36	0.64
1973.1	0.16	0.13	0.23	0.40	0.37	0.63
73.2	0.14	0.17	0.25	0.33	0.42	0.58
73.3	0.15	0.17	0.23	0.37	0.40	0.60
73.4	0.15	0.12	0.21	0.42	0.36	0.64
1974.1	0.18	0.21	0.22	0.27	0.52	0.48
74.2	0.15	0.23	0.25	0.27	0.48	0.52
74.3	0.15	0.22	0.27	0.28	0.45	0.55
74.4	0.20	0.16	0.24	0.31	0.45	0.55
1975.1	0.21	0.26	0.20	0.23	0.57	0.43
75.2	0.21	0.23	0.25	0.24	0.51	0.49
75.3	0.20	0.24	0.27	0.20	0.53	0.47
75.4	0.14	0.25	0.28	0.26	0.46	0.54
1976.1	0.14	0.25	0.28	0.25	0.47	0.53
76.2	0.14	0.24	0.30	0.24	0.47	0.53
76.3	0.17	0.23	0.28	0.21	0.51	0.49

*Since the subcompact and compact specialty categories were not included in the first four columns, they do not sum to unity. These two categories were included in the "small" classification.

That's entertainment?

The typical teenager reaching high school graduation will have logged at least 15,000 hours before the television screen, more time than any activity other than sleeping. How is television influencing the way children learn? More specifically, has television viewing had an impact upon children's acquisition of reading skills? These questions are a constant concern to parents and educators who worry about the magnitude of this potent influence in children's lives. Patricia H. Duncan, associate professor of education in the Department of Elementary Education, has examined these and other questions concerning television and children.

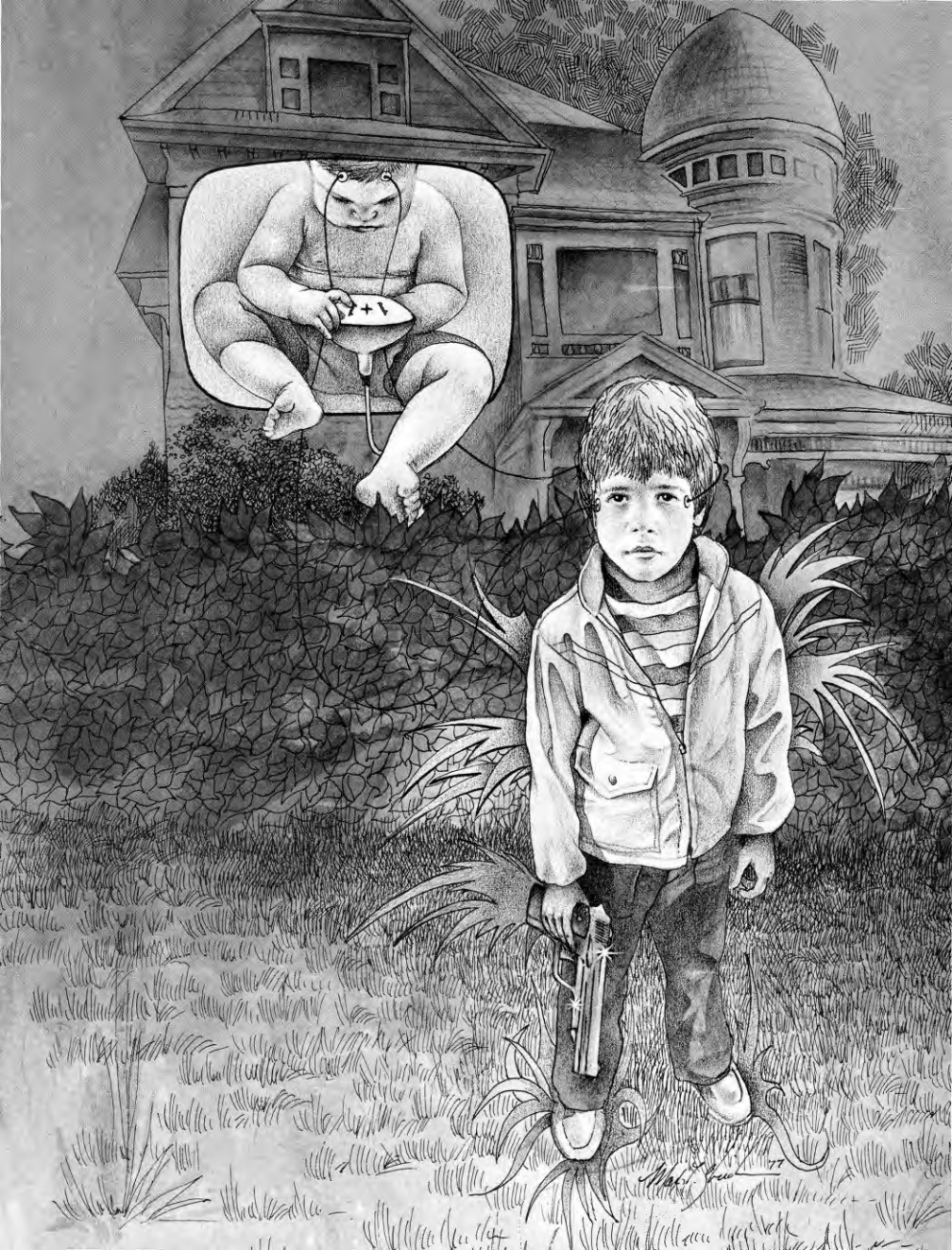
By Patricia H. Duncan

How is television influencing the way children learn? More specifically, has television viewing had an impact upon children's acquisition of reading skills? Could television produce generations who do not use, or select not to use, the previously powerful tool of the written word for passing on culture? With the recent popular emphasis on "back to basics" in education, it seems unlikely that Americans are ready to accept a situation in which a sizable segment of the population does not learn to read and write functionally but substitutes other media for purposes of communication. Yet census figures from the surgeon general's research program in 1972 estimated 96-99 percent of the families in the United States own at least one television. According to A. C. Nielsen, children under five watch an average of 23.5 hours of television per week.[1] John Murray of the National Institute of Mental Health reported that American television sets are turned on for approximately six hours per day.[2] George Gerbner, dean of the University of Pennsylvania's School of Communication, concludes that, "Television has profoundly affected the way in which members of the human race learn to become human beings.[3]

Present research efforts have told us much about the emotional effects of television on children. Less well documented are conclusions concerning the effects of television on cognition, or the development of language and thought. It therefore becomes imperative for those charged with the responsibility for educating youngsters to examine the important questions which will enable us to protect children from the harmful effects of television on learning while utilizing fully those aspects of the medium which enrich learning.

Does the Time Spent Watching Television Interfere with the Development of Reading Skills?

It stands to reason that any pastime which consumes so many of a child's waking hours will deny to him opportunities for other activities. And, unfortunately, according to a recent



research review, the amount of television viewing is greater for those who most need other educational experiences: young people of lower socio-economic status and those low in academic achievement and intelligence.[4] Researchers and teachers observe that the children of the television age approach the learning situation with an attitude of spectatorship, a passivity which conditions them to respond to but not initiate action. Since television usually solves a problem in 30 or 60 minutes, teachers find that children have a low tolerance for activities which are not dramatically presented or which promise less than immediate gratification. Because reading behavior demands active participation, sustained attention, and eventually self-initiation, it is not compatible with those behaviors utilized in watching television. Additionally, television presents a complete audio-visual package. There is little room for developing visual imagery on the part of the viewer. Says Dorothy Cohen of Bank Street College of Education, "T.V. has taken away the child's ability to form pictures."[5] Teachers are encountering children who cannot understand a story without visual illustrations.

Television viewing also cuts down on conversation (a prerequisite of reading) and attending behavior. A ten-year-old from New York remarked, "It bugs me when someone is watching with me. If your friend is bored, you have to go out or make conversation. That's hard."[6] On the other hand, one elementary school teacher noticed that her students seemed more talkative. She concluded that at home, they can't talk when the television is on. They seemed to be" . . . starved for conversation.[7]

Messages from commercials and 30-minute serials are hammered home vividly. As a result, little is required to sustain one's attention. With continuous television watching, children learn to tune out the rest of the world. This phenomenon leaves them with deficits in the attending behaviors necessary for participation in the more abstract activities of talking and reading. Many elementary classroom teachers realize that their profession currently requires a modicum of "show biz" in order to be successful.

Public interest groups, such as ACT (Action for Children's Television), P.T.A., Committee for Children's Television, and even commercial broadcasting executives have urged parents to help children become selective viewers. Parents who have tried to do this have often been surprised and delighted that their children can substitute and enjoy a wide range of interests. A New York mother of a four-year-old son observed that he began making up his own playtime characters instead of imitating those on television when she curtailed his viewing time.[8] In addition to initiating selective viewing by their children, parents are advised to view television with their children. By commenting and criticizing distorted or inflated presentations, parents can help children evaluate what they see.

How Does Television Influence the Language Skills and Reasoning Abilities Associated With Reading?

Research pertaining to the effects of television on children's language development has yielded both positive and negative data. Educational Testing Service reported in first- and second-year evaluation studies of *Sesame Street* that young children who watched the program showed gains in knowledge of shapes, quantities, and classification skills as well as the more specific word recognition and readiness skills tested. It was acknowledged, however, that those children who watched most consistently and who made the greatest gains were also brighter and probably more interested. On the other hand, *Sesame Street* has been criticized by educators and educational programmers in both United States and Great Britain for stressing rote-type learning which features "right or wrong" questioning strategies as opposed to more cognitively-based presentations. Tentative positive conclusions were also drawn from a study of children's viewing of broadcast news. Children who watched televised news were found to have moderately increased knowledge of political affairs, popular events, and persons. These children were also stimulated to discuss news with parents and peers and to seek additional information on topics.[10]

As a part of a grant from the United States Office of Child Development, researcher Mark Milkovich and his associates at Michigan State University explored the relationship between television viewing and language development.[11] Children in kindergarten through the sixth grade were tested and interviewed to determine whether or not there was a significant relationship between language maturity and television viewing habits. It was discovered that television exposure generally inhibits expressive language, especially for children in the eight to 11 year age range. Effects were most negative in areas related to semantics or meaning associated skills. While this is only one study, it does point with caution to the possibility that children who are heavy television consumers may not be developing certain language skills at a time when these skills are most necessary as a basis for learning to read and write.

One of the ways that television affects the reasoning abilities of children is in the presentation of social models. Unlike written literature, with which children can perceive sequential information about the motives and consequences of a character's behavior, television drama presents modifying cues which are subtle, inexplicit, and not always contiguous with the dominant action. Consequently, young children often comprehend social behavior portrayals inaccurately and with distorted views of causal sequences in plots. There is evidence to suggest that the failure to understand cues related to television aggression is related to the tendency of young children toward antisocial acts after viewing.[12] Although the ability to understand the interrelationship of scenes within television plots improves with increasing age, the question still persists: will young children, who do not use logical reasoning skills in order to sustain interest in and attention to television dramas, become learners who will refuse to deal with the information load necessary for processing causal relationships in prose?

How Do The Attitudes Acquired Through Watching Television Affect Learning to Read?

It is well documented that television significantly affects emotional and social behavior. Studies supported by the National Institute of Mental Health under the direction of the surgeon general's Scientific Advisory Committee on Television and Social Behavior have presented convincing data showing that children are exposed to increasing amounts of violence (cartoons lead in violent programming as of 1969).[13] Several studies have noted that children who view violence and aggression regularly on television are likely to be drawn to violence in the world around them and will espouse favorable attitudes toward the use of violence in resolving conflicts. Young people often describe television dramas as accurately portraying reality.[14] Preference for violence, which appears to persist into the teens, may ultimately affect children's preferences in both speech and reading, and may tend to restrict the range of literary interests and tastes to which they will respond. The magnitude of the attitudinal influence of television is illustrated by Alberta Siegel who reported the results of a national survey in 1973. By age two, 90 percent of the children surveyed were singing television advertising jingles; 87-90 percent were asking for food and toys advertised on television; and 90 percent of the three-year-olds surveyed could identify *Big Bird* and *Fred Flintstone* by name.[15]

Not all of the effects of the medium have been negative. Programs such as *Fat Albert and the Cosby Kids* and *Misterogers' Neighborhood* have shown that children can learn and transfer prosocial behaviors after viewing them on television. Several studies revealed that viewing prosocial programs accompanied by related curricular activities aid children in understanding the content of the programs.[16]

Of special concern to the feminist movement has been the sex bias displayed in television programming. At least four studies have shown that male characters significantly outnumber female characters in television programs viewed by children. Male television characters typically demonstrate qualities of activity, self-reliance and aggression, while female portrayals usually reflect passivity, fearfulness, and lack of self-confidence. Children with higher television viewing times were found by Fruch and McGhee to have more rigid sex role preferences.[17] Will continuous viewing of rigidly stereotyped models provide for a climate in which boys can perceive a sedentary activity such as reading as something of masculine acceptability? Will girls feel free to select stories which are high in adventure and activity? It would certainly appear that television has at least a small part in helping children define their sex roles both in and out of the classroom.

Can Television Be Used Effectively to Teach Reading?

The medium of television possesses powerful and unique capabilities. While instructional television has shown great promise, many of the resources available for teaching through television are as yet untapped. Two thorough and recent reviews of the literature evaluating the effectiveness of instructional television (ITV) indicate that students at all grade levels learn well from ITV. High percentages were reported for seven curricular areas in which ITV taught as well as or better than traditional methods.[18] Reviewers Chu and Schramm concluded that some teachers will be resistant to the use of ITV for direct teaching. Administrators as well as teachers and pupils in elementary schools were seen as most favorable to the use of ITV. Chu and Schramm also observed that liking ITV was not always correlated with learning from it.[19]

During the winter energy crisis of 1977, both educational and commercial television in Columbus, Ohio, demonstrated that instructional programs can be continued effectively through heavy use of the medium. The ETV station in Columbus offered programs designed to supplement classroom work. In addition WBNS-TV and Radio each offered four hours of free time daily for a

three-week period for "lessons." Lesson plans and study guides were developed and printed ahead of time in the newspapers. In this "School Without Schools" project a parent advisory board helped to orient the public and to insure open communication in the community. Teacher participants in the television lessons were given a crash course in planning and performing. (A fringe benefit of the project was that open channels of communication were established between parents and educators. Parents began to appreciate the scope of the school curriculum and did not have to rely on feedback from their children to know the focus and expectations of daily lessons.) Despite the urgency of the situation in which it was developed, the Columbus project provided a model for using television for maximizing instruction.[20]

The efforts of *Sesame Street* and *Electric Company* to teach reading and reading readiness skills has been reported by ETS research.[21] *Sesame Street* has demonstrated that young children can learn to recognize, name, and associate sounds with the letters of the alphabet. Experimental groups studied also learned sight words and left-right orientation. To meet the needs of the school-age group *Electric Company* was developed, using the format of rapid-fire animated and real-life sketches to teach basic phonemic and syntactic generalizations. Emphasis on reading comprehension in typical format was minimal. The ETS Study reported in 1973 revealed that first and second graders who viewed the program as part of classroom learning gained significantly across the full spectrum of skills. Smaller gains were observed for third and fourth graders, most of whom had previously mastered the skills presented. The researchers concluded that shows like *Electric Company* are most effectively used when children are given preparation for viewing and can participate in follow-up activities prepared by their teachers. This conclusion is supported by Robert Gagné, noted educational psychologist, who stated, ". . . A television program can introduce and guide the learning. But again . . . the learner must have a chance to apply the skill."[22] Critics of *Electric Company* such as Nancy Roser[23] feel that the show should broaden its scope to include an appreciation for reading as a total communication process rather than merely a set of decoding skills.

Similar criticism of the format and emphasis of *Sesame Street* and *Electric Company* has kept the British Broadcasting Company from purchasing the shows. Joyce Morris, reading consultant to BBC, explained that British children would not be attracted to the fast-paced style which captures American audiences.[24]

The BBC has been pioneering its own reading-with-television programs. Their *Look and Read* which is directed at children seven to nine years and older predates *Sesame Street* by five years. The programs are built around a high interest adventure story presented in episodes reminiscent of *Masterpiece Theater*. The stories are written with a controlled vocabulary based on the speaking and writing vocabularies of British children. A teacher's guide allows the classroom teacher to introduce the story and teach unfamiliar words and phrases prior to viewing. The children view segments of about four minutes each, ending at "cliff hanger" points to keep interest high. Then the children participate in reading practice sessions which provide contextual reading as well as a review of phonic generalizations with a puppet, "Wordy." A second BBC program, *Words and Pictures*, which is aimed at pre-schoolers, also uses story format to sight vocabulary in words and phrases.

Presently, BBC evaluation of the programs is only in the formative stages, but British educators feel that the story format will motivate children to read books.

Aside from instructional and educational television, commercial programs can be valuable teaching aids. In Rochester, New York, a video graphics teacher, Ann Hilkert, has found that developing their own television programs has helped remedial readers gain needed communication skills. In preparing an actual video tape children must select and research a topic, read and write a script, and evaluate the final product. Since television is natural to the experience of the students, they are enthusiastic about participating in the development of their own programs.[25] Schools in Philadelphia, Pennsylvania, and Mount Vernon, New York, are piloting a program which uses videotapes of commercial shows and television scripts to teach reading and other communications skills to middle-school-age students.[26]

The staff of the *Journal of Reading* (a publication of the International Reading Association) initiated a survey to find out how extensively commercial television was being used to teach adults to read. Returns of the questionnaires from commercial stations in major cities of the United States and Canada indicated that nine stations currently show or have recently shown series for teaching reading to adults. One of the exemplary programs is Baltimore's *Learning to Read*. It is aired early in the morning on WBAL-TV for one half hour five days per week. The station sponsors the program in cooperation with the Baltimore public schools.

A mailing list of 7,000 names has been compiled of people requesting the free material offered. In addition to adult functional illiterates, the program has proved to be useful to foreign residents in the Washington, D.C., areas as well as to the parents of retarded children.[27]

Suggested guidelines for using commercial television within the classroom have been prepared for teachers in a recent publication of the International Reading Association.[28] Reading teachers are urged to use approaches such as the following:

Watch television yourself, especially those programs which students favor, to find out how to use what you see in the reading/language arts program;

Encourage students to watch good television programs;

Survey your students to determine their television preferences;

Encourage bilingual and nonstandard English speaking students to listen carefully to the spoken word on television. Reinforce this with reading and writing activities in the classroom;

Use television themes for stimulation verbalization. Oral discussion, debates, and role playing about television characters and episodes can be highly motivating. Television game formats can be adapted for classroom use.

Collect books, magazines, articles, posters, and newspaper accounts related to favorite television shows for use as reading material.

Study skills, such as technical vocabulary, note-taking, referencing, and summarizing can be taught using a favorite program.

Correlate writing activities with favorite shows.

The impact of television on learning to read is difficult to determine. The influences of television are varied—some so subtle as to escape evaluation. What can be concluded is that television is a powerful medium which consumes many of the waking hours of both children and adults. Its formats are habitual; as a modeling agent, television will become increasingly stronger. Educators and parents concerned about the influences of television programming would be remiss not to heed the remarks of Albert Schweitzer: "Example is not the main thing in life—it is the only thing."

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[5]"What T.V. Does to Kids, *op. cit.*, p. 65-70.
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[7]*Ibid.*
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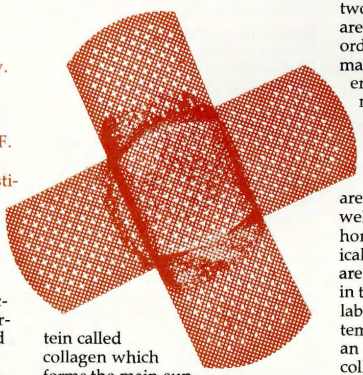
More than just a facelift

The Division of Plastic and Reconstructive Surgery has an important but seldom seen adjutant—its research laboratory. Under the direction of Dr. I. Kelman Cohen, chairman of the division; Dr. Wyndell Merritt, plastic surgeon; and Dr. Robert F. Diegelmann, a biochemist, researchers in the laboratory investigate the biochemical and histochemical phenomenon of wound healing.

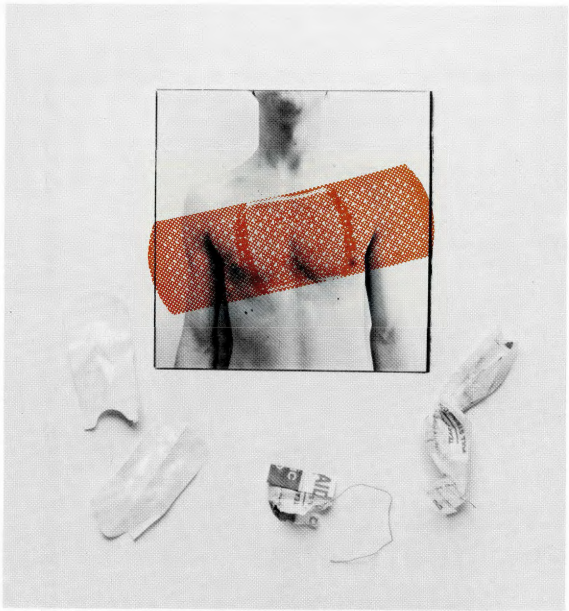
By I. K. Cohen



Wound repair is a normal reaction to injury of any kind. Understanding the dynamics of wound healing is fundamental to the treatment of elective surgery, accidental trauma, severe burns, or an inherited syndrome. In the plastic surgery research laboratory, wound healing processes are examined using wound models which have a biochemical common denominator—a fibrous protein called collagen which forms the main supportive structure of skin, connective tissue, cartilage, tendon, and bone.

Collagen, as we grow, recover from wounds, and age, is constantly being remodeled by synthetic and degradative processes. In healthy individuals, these two phases of the collagen cycle are held in equilibrium in an ordered, specific, and complex manner. When functioning properly, this machinery leads to normal wound healing in the skin as well as damaged or diseased internal organs.

The mechanisms by which the wound healing processes are activated and controlled, as well as the effects of malnutrition, hormones, enzymes, and chemicals on wound restoring events are poorly understood. Scientists in the plastic surgery research laboratory study cell culture systems and rat wound models for an explanation of the dynamics of collagen synthesis and degradation. The inflammatory cells of healing wounds and other types of tissues, including normal skin cells, are isolated in culture and studied using biochemical and histochemical techniques. Various drugs and chemical agents are



also used to create defects in collagen production. These studies have helped to explain why some tissues are defective in collagen production while other tissues have excessive collagen accumulation. Eventually, from these and other related investigations, it is thought the physician can treat wound healing problems through direct manipulation of collagen metabolism.

Each wound healing model examined at MCV lends its own particular answers to the questions of how and why human wounds repair, both normally as well as abnormally. Burn injuries which result in one of the body's most lethal and disfiguring wounds are studied in hopes of finding optimal healing conditions to drastically reduce the mortality for burn patients. Findings from research on collagen metabolism in fascia (a sheet of fibrous tissue beneath the surface of the skin) are related to hernia repair and tendon function by Merritt. Keloids (essentially overhealed wounds) are also studied in humans. These disfiguring skin lesions result from excessive collagen deposition and occur in a significant proportion of blacks in this country. The treatment, frequently involving surgical removal, is costly and often uncomfortable.

Collagen metabolism in the liver is another wound healing model examined in the plastic surgery research laboratory in cooperation with Dr. Philip Guzelian of the Department of Medicine. The metabolism of hepatic collagen is of primary importance in understanding liver diseases which result from chemical poisoning, severe hepatitis, or alcoholism. Research is directed at finding the answers to two fundamental questions: what is the source of hepatic collagen and what regulates the content and distribution of collagen in the liver? A cell culture system is used to investigate the collagen producing potential of various types of isolated liver cells. A method has also been developed which permits determination of the rate and regulation of collagen synthesis in intact tissues. These advanced techniques have greatly simplified the study of liver collagen metabolism and, for the first time, the potential importance of cell interaction in the regulation of collagen metabolism is being critically examined.

This significance of altered collagen metabolism in breast cancer is the subject of another area of investigation. Normally, collagen does not accumulate in breast tissue, but, in benign and malignant breast cancer, the tumors are frequently surrounded by a thick wall of collagen. If the collagen matrix in invasive tumors is abnormal, this may be related to the process of tumor metastasis. The effect of estrogens and other female sex hormones which influence breast cancer are also examined to see if they alter breast collagen. Breast cancer lends itself particularly well to the study of hormonal and enzymatic effects on collagen synthesis in cancer tissues. Someday these studies may be useful in predicting and perhaps regulating the clinical course of the cancer patient.

These studies, plus satellite investigations being conducted by plastic surgery physicians, residents, and selected medical students, provide a forum at MCV for extended research into other collagen related problems such as premature aging, tendon repair, wound dressing dynamics, and allergic skin reactions. Both the federal government and the private sector have provided funds to help support research into this complex mechanism. Each discovery leads to new questions for which new answers must be found—answers that go far beyond the cosmetic luxury that plastic surgery implies.

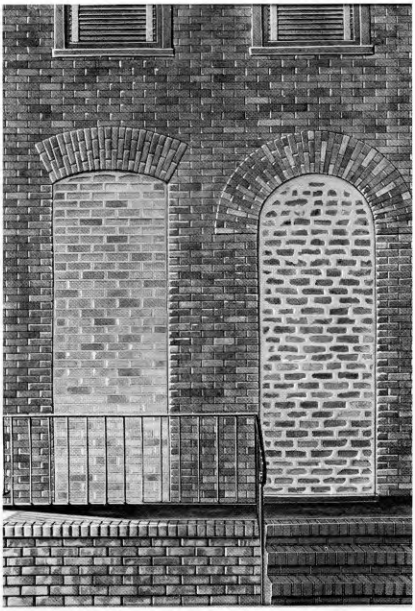
Swallow Windows 1975 Acrylic on Paper 18″ x 12″

There's no place like home

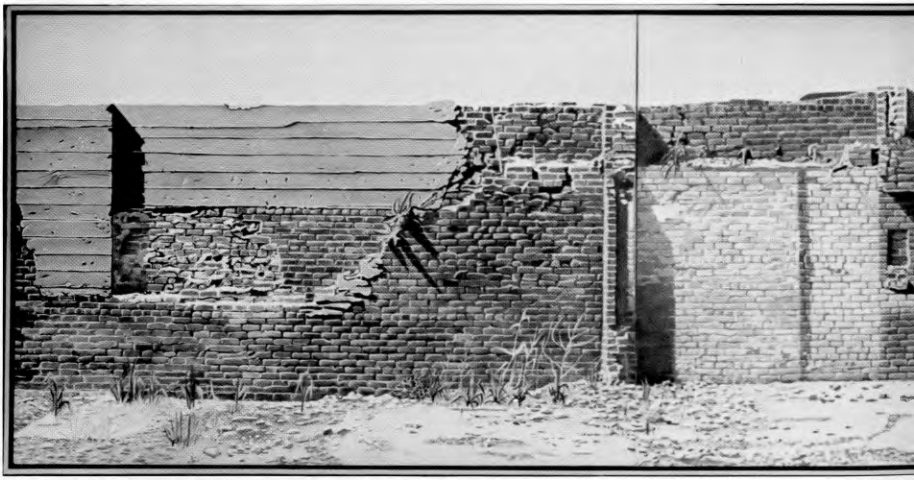
James Miller, assistant professor in painting and printmaking, has exhibited his work in numerous galleries, among them the Virginia Museum of Fine Arts, the Smithsonian Institute's Traveling Exhibition of Prints and Drawings, and the Alecto Gallery in London. On his current work, he says:

"Much of my recent painting and drawing has employed fragments and passages from suburban houses and urban structures. Such images offer a vehicle to consider nuance in proportional and planar relationships and the interplay of pattern, light, surface, and color. As these formal elements are handled and developed, choices are made and emphasis is given to the idiosyncratic and evolving pictorial needs rather than an attempt to simply copy appearances."

Dormers 1975
Oil on Canvas 60″ x 40″

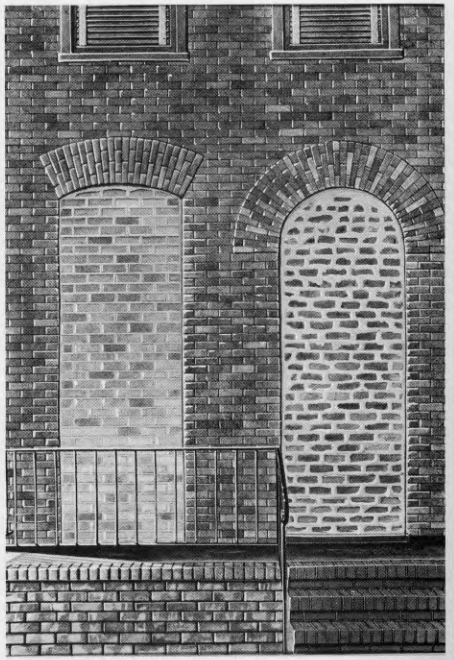


Cary Street Wall
Acrylic on Paper 21″ x 15″



Downtown Wall 1976 Oil on Canvas 136¾″ x 32½″

Dormers 1975
Oil on Canvas 60″ x 40″



Cary Street Wall
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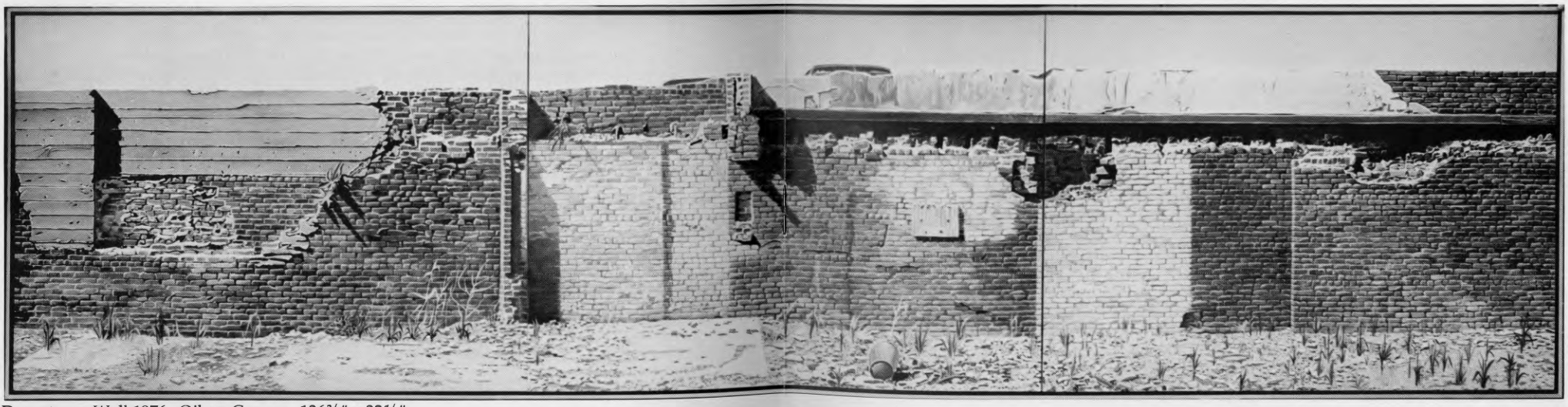
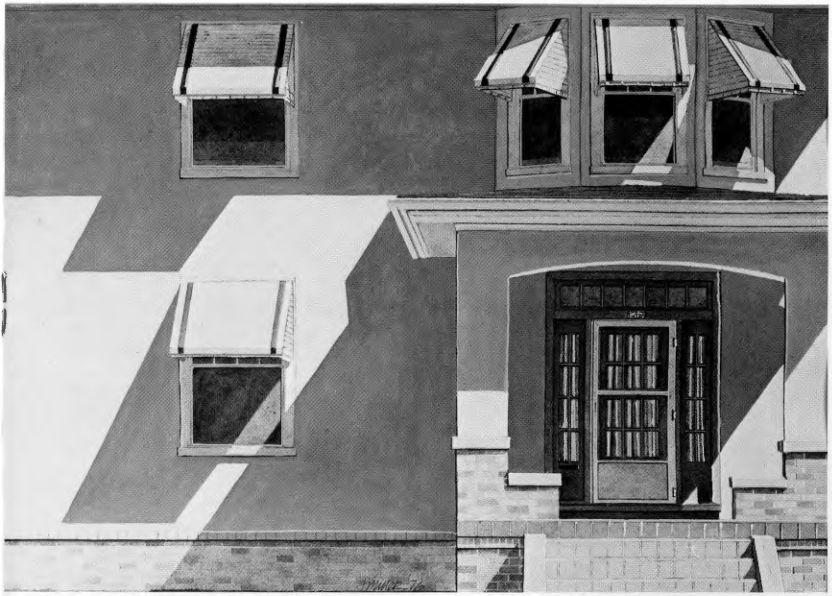
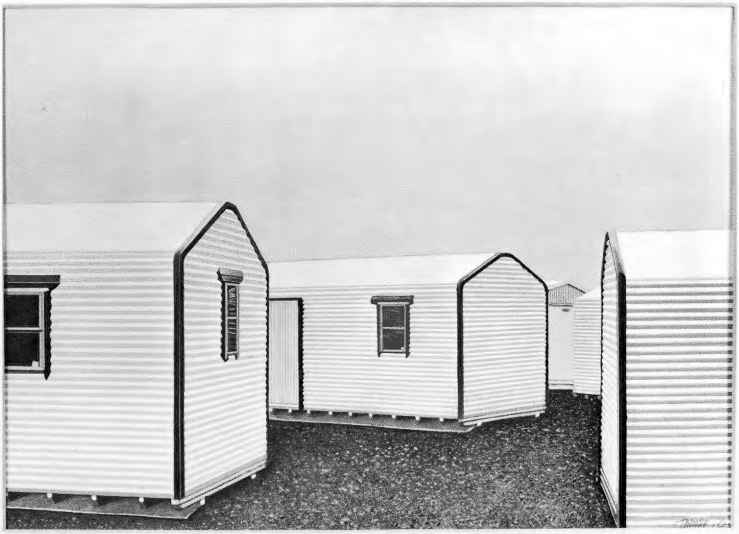
Ochre House 1976 Acrylic on Paper 21″ x 15″



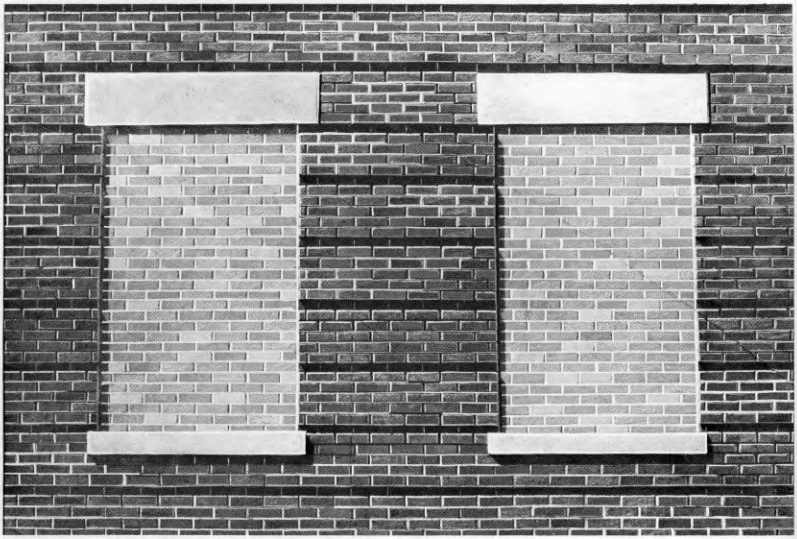
Downtown Wall 1976 Oil on Canvas 136¾″ x 32½″



Ochre House 1976 Acrylic on Paper 21″ x 15″

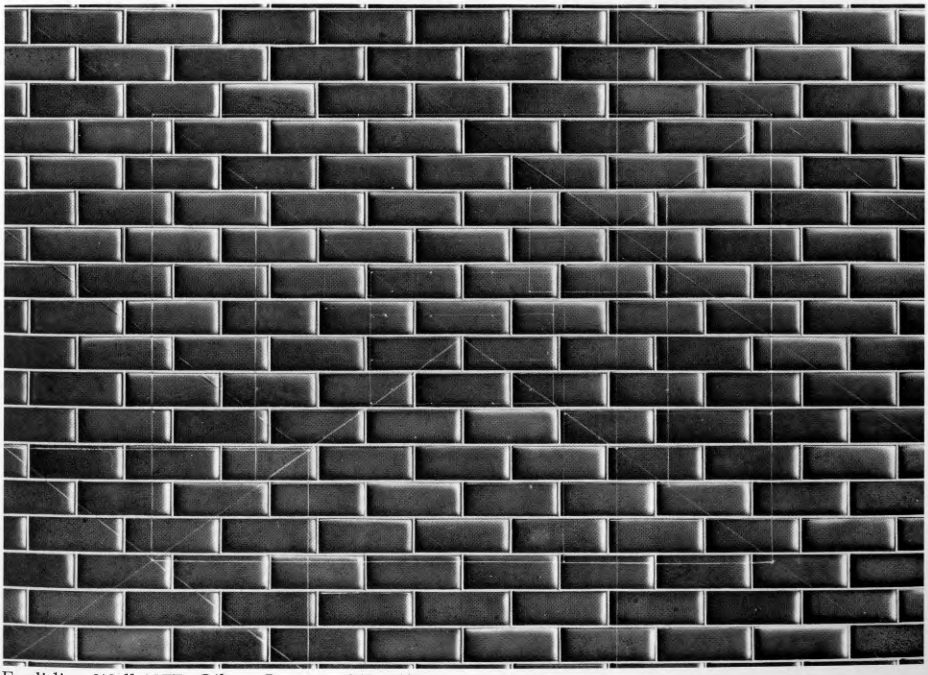


Corrugated Shelters 1976 Acrylic on Paper 21″ x 15″

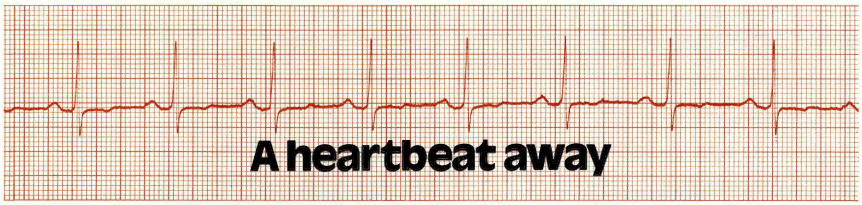


Noldes Bread 1976 Acrylic on Paper 35″ x 25″

Grantham Wall 1976
Acrylic on Paper 35″ x 25″



Euclidian Wall 1977 Oil on Canvas 84″ x 60″



A heartbeat away

The university has had a distinguished role in the development of heart transplantation. Dr. Richard Lower, chief of cardiothoracic surgery, developed the surgical technique which ultimately made human heart transplantation possible. At that time, Lower was working with Dr. Norman Shumway at Stanford University. Lower continued his work on heart transplantation when he came to VCU.

For many years, Louis Russell, the fourth heart transplant patient at the university's hospitals, was the world's longest surviving heart recipient. Russell survived for almost seven years in excellent health after his transplant until he died in 1973 of coronary artery disease. Currently, two other MCV Hospital heart recipients are surviving in excellent health after being rehabilitated from a bedridden state by cardiac transplantation.

These results indicate that heart transplantation can be a remarkably effective therapy which is both practical and currently applicable. In fact, in the current Stanford series, 70 percent of patients given heart transplants for end-stage cardiac failure survive one year or more. Without a transplant, essentially all of these patients would have been dead within a year.

By Dr. Francis T. Thomas

The triumph of heart transplantation is well known to those who have worked with the successful MCV transplant recipients. All successful patients were returned to full rehabilitation. Russell engaged in a demanding schedule of work, travel, and lecturing which would tax the capability of any of our bodies. The other successful patients have pursued a quieter but equally successful rehabilitation. Their full return to a normal life from a bed-ridden existence is in essence the triumph of cardiac transplantation.

The tragedy of cardiac transplantation is that triumphs do not occur more frequently. In addition, over 50 percent of recipients die of rejection of their transplant from infection caused by the administration of drugs to suppress the body's immune system and prevent rejection. Since little is known of the mechanism of rejection, the drugs used for its treatment cannot, for the most part, be tested for a specific action related to rejection. Instead, doctors have had to depend upon a non-specific depression leaving the body susceptible to a host of foreign microbes which can cause infectious death. The most widely used immunosuppressive drugs, Prednisone and Imuran, are unable to prevent heart rejection in the first and second month after transplantation in over 50 percent of cases. These inadequacies of the drugs currently used to treat rejection are the cause of most of the failures in heart transplantation.

Five years ago, the kidney transplant research group at MCV began intensive efforts to develop better immunosuppressive drugs which could be both more potent and more selective in their action against rejection. A serum (antithymocyte gloubulin or ATG) which is produced in rabbits by the injection of human thymocytes, called "T" lymphocytes, was developed. This serum acts to remove human lymphocytes from the blood's circulation shortly after injection into the human transplant recipient. Lymphocytes, especially the so-called "T" lymphocytes, have been shown to be the primary cause of graft rejection. Formerly, rejection was believed to be due to antibodies developed against the graft itself. Further refinements in the manufacture and quality control of this material over a period of years has resulted in a product which is remarkably efficient in preventing graft rejection during the early period after transplantation. In over 200 patients treated with ATG at the Medical College of Virginia over the past five years, none have lost their grafts to rejection in the first month after

transplantation. This is traditionally the period of highest risk for graft loss to rejection. More recent studies in MCV kidney patients have shown that some batches of ATG (called high potency ATG) can achieve an even more outstanding success in preventing rejection essentially in all patients during the first three months after transplantation.

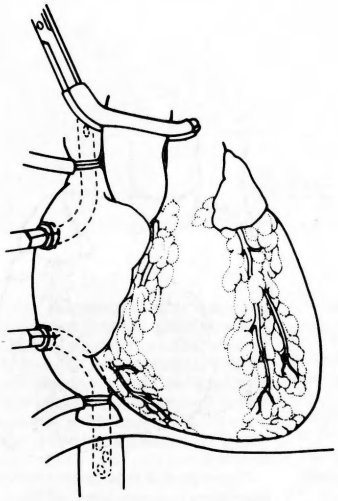
These results in the kidney recipients suggested the advisability of adding rabbit ATG to the treatment of heart transplant recipients who suffer the same types of rejections after transplantation. The first rabbit ATG was used in 1972 in a man who is now the longest surviving MCV heart transplant patient. He has been completely rehabilitated. In all heart transplants done at MCV since that time, patients who have been given adequate doses of ATG have not died of rejection.

These clinical results were, and continue to be, quite exciting to us in terms of improving the chances of success of kidney and heart transplants. Like all clinical studies, however, the long term value of the information obtained is greatly enhanced by scientifically pursuing a hypothesis to explain the improved clinical results rather than merely collecting clinical data in a non-directed manner. In 1973, our group began test tube studies of lymphocyte function in an attempt to answer the question, "What is the mechanism of action of ATG which allows it to so effectively eliminate rejection after transplantation?" We were able to get financial support from the National Institute of Health and the Richmond Area Heart Association to pursue this question. In some cases, we could show directly how these recipients' lymphocytes acted to kill donor cells. Most intriguing of all has been our recent demonstration that in some recipients, "suppressor cells" act to block rejection by preventing the development of the "killer" cells after transplantation. All of these studies have given us new insight into mechanisms of graft rejection.

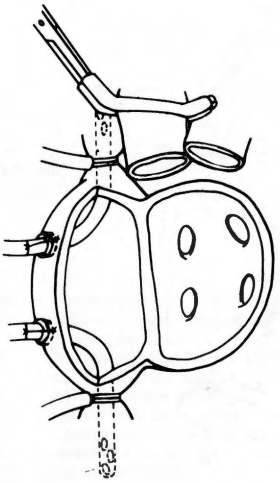
In regard to the mechanism of action of ATG, our group was able to uncover some rather exciting findings at an early stage of activity (a happy but not too frequent situation in scientific endeavor). In 1974, using a newly developed test to identify so-called "T" (or thymus-derived) lymphocytes, we first reported the unusual ability of ATG to prevent rejection was related to its excellent capability to destroy circulating "T" lymphocytes. In contrast, we found other agents, including steroids, were relatively ineffective in attacking "T" lymphocytes. These studies were of practical significance in demonstrating the need to develop ATG with a high level of specific activity against "T" lymphocytes. The findings are also of theoretical importance in demonstrating the central role of the "T" lymphocyte in graft rejection.

These studies represented the beginning of a new focus on the "T" lymphocyte in human graft rejection. Results obtained at MCV have since been confirmed in kidney transplant patients by groups in Boston and in heart patients by Shumway's group at Stanford. The Stanford group has produced ATG using techniques developed and refined at MCV which are apparently very successful in reducing graft loss to rejection in cardiac transplant recipients. This group feels their current 70 percent graft survival rate is largely related to the use of this new immunosuppressive agent. These results are the center of much interest (both clinical and theoretical) in transplant immunology today.

Last year, the MCV heart transplant team including Drs. Lower, Eric Kemp, Seabolos Szentpetery, and the author with the laboratory help of Dr. Judith Thomas, reported on the first group of cardiac transplant patients who were treated by a new technique called "immunological

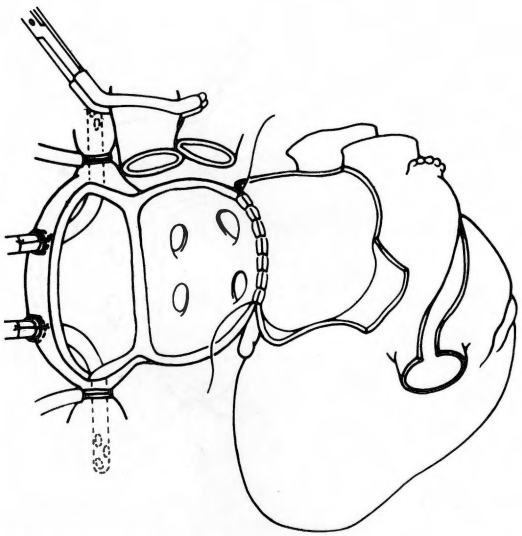


Recipient heart isolated and heart-lung machine tubes in place. Clamp is on the aorta.

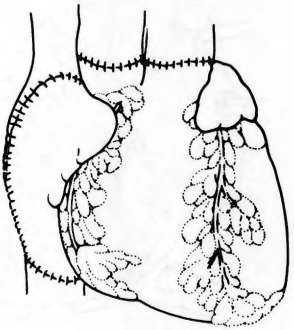


Recipient heart excised, leaving the posterior atria. The chamber with the four vessels entering is the left atria and the two tubes going to the heart-lung machine are in the right atria.

monitoring." This method of treating patients after transplantation differs from standard procedures of suppressing the immune system. In standard immunosuppression, stereotyped doses and types of immunosuppressive drugs are given to all patients. More recently, studies in the MCV laboratories have indicated that recipients show wide variations in their requirements for suppressive drugs. Some recipients (probably because they do not have a highly responsive immune system) can get by with low doses and less potent types of immunosuppression. Other recipients for unknown reasons are highly responsive immunologically and will develop severe rejection unless high doses and potent suppressive drugs are used. With the use of fixed suppressive regimines which are not tailored to particular recipients, the low responders may get too much drug suppression and die of infection. Conversely, the high responders may not get enough suppression and as a result develop severe irreversible graft rejection. The MCV laboratories developed techniques to measure the reactivity of the potential recipient's "T" lymphocytes using radioactive DNA-RNA techniques before transplantation. This allowed the prediction of how much suppression the patient might require after heart transplantation. Furthermore, our laboratory developed techniques to follow the level and reactivity of "T" cells after transplantation in order to plan an individualized course of immunosuppression for a given recipient. These techniques allow the doctors following the patient to be aware on a daily basis of the patient's actual or potential requirements for immunosuppressive drugs. In addition, this laboratory work outlined some limits of "T" cell levels



The donor heart is being sewn in place in the recipient. Here, the left atria is being sewn in place. Following this, the right atria is sewn, then the aorta, and finally the pulmonary artery.



Completed transplant. The suture line on the left is the atrium. The two suture lines above the heart are the aorta and pulmonary artery.

and reactivity which would allow the clinician to predict with a high level of confidence that rejection would occur in the near future. The technique of "immunological monitoring" using "T" cell measurement is simple, easy, and accurate. The technique is analogous to the continuous monitoring of aircraft flight patterns over an airport in order to detect movement patterns which can lead to potential disaster unless modified by prompt intervention.

When looking to the future of heart transplantation, the picture seen is generally an optimistic one. At the present time, the 70 percent one year survival of the Stanford group should be capable of replication in other centers. The techniques used are rather straightforward and very much in line with developments and advances which have taken place at MCV over the last four to five years. The use of ATG and immunological monitoring will, no doubt, improve upon the already acceptable results of cardiac transplantation. The MCV group hopes to continue their cardiac transplantation program and perhaps expand the pool of recipients in the future. At present, four patients are awaiting cardiac transplantation here. Cardiac transplant efforts are important for the unfortunate group of end-stage cardiac patients who currently have no other hope for rehabilitation and extension of life. They are also important for future cardiac transplant effort. These efforts have a striking potential to achieve a large measure of success if more can be learned about the mechanism of rejection as well as achieving more potent and select drugs for preventing rejection without creating deficiencies in the recipients' capability to fight infections.

Will this group have fewer cavities?

Charles City County, Virginia, was once the home of the richest of the landed gentry. Their palatial estates are still located in the county, but they stand amid poverty and inadequate public health facilities. One result of these conditions is a high incidence of tooth decay among children. Dr. Sherman R. Fishman, associate professor of community dentistry at VCU, is exploring one method of offering effective, yet inexpensive dental treatment to some of the county's young residents.

The Colonial General Assembly met at Jamestown in 1634 and divided the Virginia colony into eight shires, one of which was Charles City, named for the English King's son who later became King Charles I.

It was here in Charles City County that the first official Thanksgiving was held in 1619 at Berkeley Plantation and here where Benjamin Harrison, V, signer of the Declaration of Independence, and Presidents William Henry Harrison and John Tyler were born.

But the vast James River plantations and landed gentry have given way to a population base that largely earns its livelihood outside the county in the nearby cities of Richmond, Petersburg, and Hopewell. This population of 6,158 people (74 percent black, 17 percent white, and 9 percent Indian) has a per capita buying income of $2,040, compared to $3,247 for the commonwealth of Virginia and $3,558 for the United States.

As with many rural areas, Charles City County has no incorporated towns and limited health care services. There are no dentists in the county, no central water system, and the individual wells have no natural supply of fluoride. As a result of limited preventive dental practices and a shortage of fluoride, the children have a high prevalence of tooth decay. A new fluoridated water system could be built, but a more practical and economical alternative would be to use a weekly fluoride rinse in the school system. This is the approach taken by Fishman.

His rinse program, sponsored by the National Institute for Dental Research, is one of 18 similar concepts being executed across the country. These programs are going on at the same time; yearly reports are made to the Institute and will be analyzed at the end of six years to determine the best approach—statistically and economically—for more programs to be applied throughout the country. In similar programs, studies have demonstrated an eventual reduction of decay of 25 to 50 percent and Fishman hopes for similar results in his project in this rural county 40 miles from Richmond.

The rinse procedure is administered to approximately 1,500 students in kindergarten through grade seven with follow-up examinations being given in

Swish away dental decay—a weekly fluoride rinse program being administered in Charles City County (Virginia) schools.

Berkeley plantation in 1619 was the site of the first official Thanksgiving.

Charles City County has its history as a rural area even though 70 percent of the population earn their living outside the county in urban centers.

Settlement of Charles City County began in 1613 with the area later becoming home for numerous famous Virginians who built mansions and plantations along the James River.

grades eight and nine. Powdered sodium fluoride is mixed with water by the school nurse to form a two-tenths percent solution. Enough of the solution is prepared so each school can be treated in one day. The solution is poured into disposable cups and distributed to the teachers. The children swish the solution around in their mouths for 60 seconds; the solution may be swallowed without harm. Once the children understand the procedure, the classroom time consumed is five to six minutes. The nurse spends an additional one to two hours per school mixing and distributing the solution.

Fishman visits each school twice a year to monitor and observe the program. He also reports to community groups, such as the county health department and board of education, which will provide financial support for the last three years of the program after the initial three year grant has expired.

Four dental examiners from VCU use descriptive examination criteria furnished by NIDR for determining decayed, missing, and filled surfaces. In order to insure standardization of terms and procedures, they trained on equipment similar to the type used in the schools and examined children of similar ages. Four people who serve as recorders were trained at the same time. Utilizing the four examiners, it is possible to examine completely the total population of the study in a four-day exam period. After each examination period, the data is submitted within 60 days to NIDR for processing and analysis. The data collected will broaden the base of dental knowledge at VCU and NIDR.

Comments Fishman, "The cost is less than 50 cents per child per year, and most important of all, it really works." At a time when rising medical and dental costs are plaguing the nation, Charles City County is leading the way toward a thorough, effective, and inexpensive preventive dental health care system.

Computer age maps

Throughout history, mapmakers have also been explorers, such as: Christopher Columbus, Amerigo Vespucci, John Fremont, George Rogers Clark, and Meriweather Lewis. Dr. Robert D. Rugg, assistant professor of urban studies and planning, has been exploring a system to greatly reduce the time and tedium inherent in drawing a map by hand. Rugg has utilized the modern technology of the computer to produce a map which is just as good, if not better, than its hand-produced counterparts.

By Robert D. Rugg

After three years of development, a system for computer mapping has become a reality at VCU, replacing much of the former tedium of preparing conventional hand-drawn maps. The computerized system is more flexible and powerful than hand-drawn methods, primarily because of the capability of the computer to produce numerous maps in minutes. A cartographic draftsman might take weeks or even years to complete the same maps. Although hand-drawn maps remain visually superior at the present state of the art, the advent of line plotting equipment has reduced even this human advantage.

The main elements of the system at VCU include: computer data files, computer geographic base files, information processing programs, and map plotting programs. Each of these four elements has been developed separately and were recently coordinated in a system that can produce finished maps from raw data in a completely automated process.

Here is how the system works.

Data are recorded on tape and disk files at the computer center. The largest such file at present is the complete United States Census of 1970 for Virginia.

Geographic base files are recorded which serve to relate the raw data files to specific geographic locations. For the past several years, the City of Richmond has been working with the U.S. Census Bureau to produce a "DIME" file (dual-independent map encoding) showing the coordinate location, census block, and census tract number of every street segment in the city. Similar files are in preparation for both Chesterfield and Henrico Counties, to be completed in time for the 1980 census. Through the DIME file, a particular street location can be associated with any available census data for that same location. Another file, created by graduate students in urban and regional planning, gives the central coordinates of all census tracts in the Richmond Standard Metropolitan Statistical Area.

Various programs are used to manipulate raw data files and match these results with particular geographic locations prior to producing the finished map. An example is the RADMATCH program which matches any given address, through the DIME file, with a particular coordinate location or census tract. A program called PNPOLY reviews a set of location points to find which ones are within specified district boundaries.

After the raw data have been obtained and the necessary calculations and geographic associations made, one of two programs is used to execute the final map product. Both of the existing programs now use the line printer for output, but may soon be superceded if more sophisticated line drawing devices are obtained by the Computer Center. C-MAP ("choropleth mapping program") executes a shaded area pattern within each subarea of the map. An example, Figure 1, shows the population increase of counties along the Eastern Seaboard from 1960 to 1970. This inexpensive program was originally developed by Morton W. Scripter at San Fernando Valley State College, California, on a mini-computer. The SYMAP program ("synagraphic mapping"), by contrast, requires a computer with a memory at least 24 times as powerful. It is the most popular product of the Harvard Laboratory for Computer Graphics and Spatial Analysis. It can produce "chronopleth" maps, but is most frequently used for "isarithmic" (contour) maps showing interpolated contour surfaces between fixed data points. An example of a map produced by this program is shown in Figure 2. Presently under experimentation is a method of adapting the SYMAP program to another type of map product, the classic type of thematic map known as a "dot map."

Applications

Computer map techniques are adaptable to most phases of data collection and analysis in community planning. Nearly all planning activities make some use of maps and nearly all data files require some system of geographic identification. The use of computerized mapping greatly facilitates processing of this type of information. "What if?" questions can be posed and answers found by computer map displays; the same questions might never

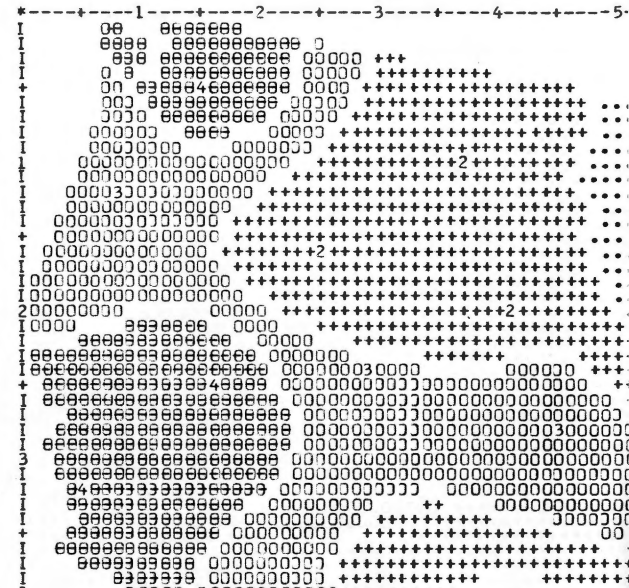
Population increase along the Eastern Seaboard by county

be asked if one knew it would take a draftsman weeks or months to find an answer. Among the many specific applications of computer mapping are zoning and land use plans, facility location choice, school and political districting, transportation modeling, land-use modeling, and population forecasting. Using similar techniques, a joint environmental modeling project to help plan for regional water management needs is currently underway by Richmond Regional and Crater Planning District Commissions.

The most obvious possibility of the existing system is to produce a computerized atlas of the region's census data. This project, being prepared by VCU's Center for Public Affairs of the School of Community Services, will provide a convenient visual rendering of the data in the census, in a form that is easier to grasp and interpret than conventional census data tables and files. It is expected that such an atlas will become a standard reference for workers in public agencies, the private sector, and for schools and libraries in the region.

The future holds promise of increasing applications for computer cartography. For example, sattellite "photographs" from the LANDSAT program are not photographs at all, but remotely sensed computer map data files that are later "plotted" in much the same way as the maps shown here. Future applications of the LANDSAT program may include updating of land-use information contained in regional planning district files. One application of such an updating procedure would be improved predictions of flood hazard in rapidly urbanizing river basins.

Computer cartography systems are widely used in many areas of the United States and abroad. The system developed at VCU is not unique, but does represent a locally available resource that may be used to help improve the quality of community services and planning in this region.



Income regions of the United States, adjusted for racial differences

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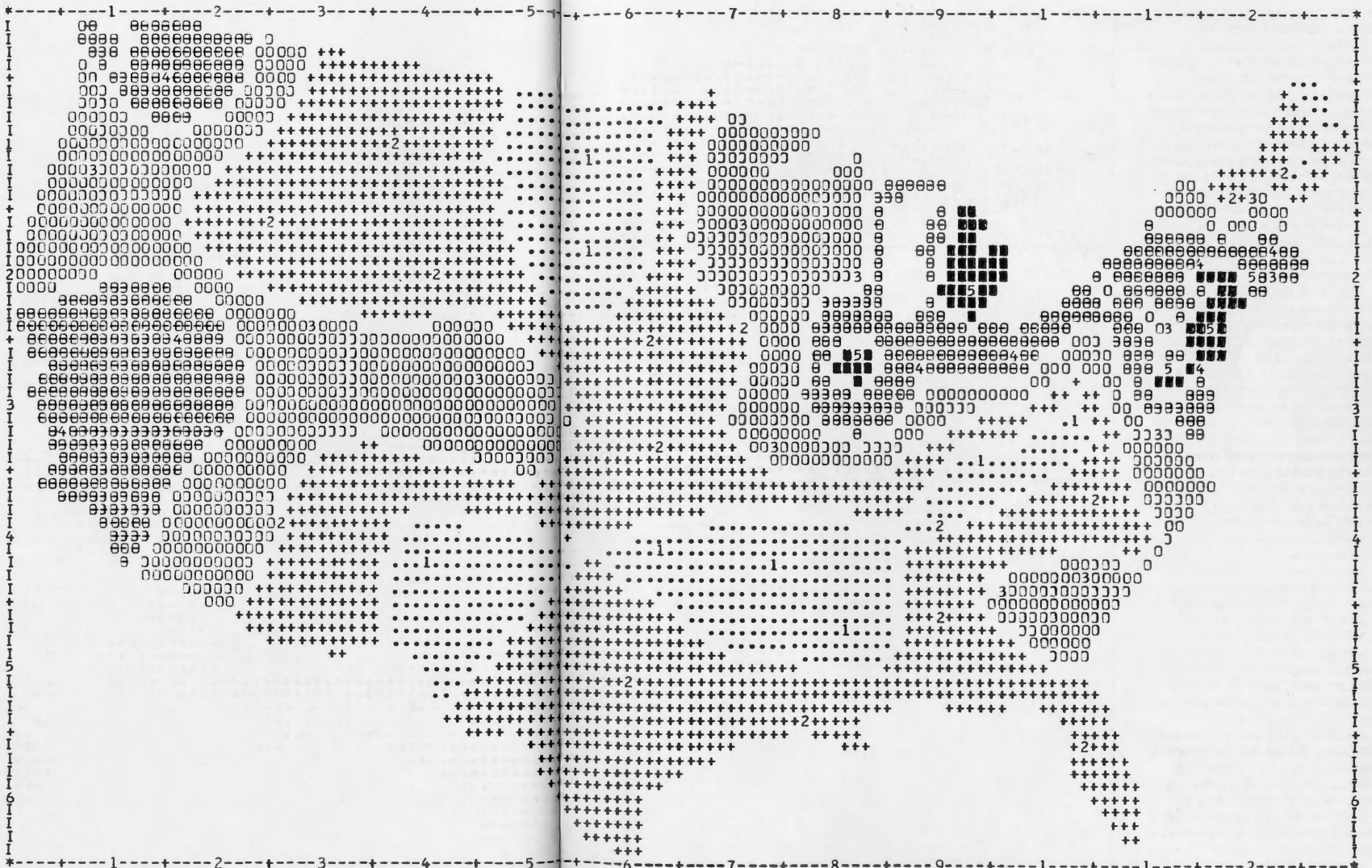
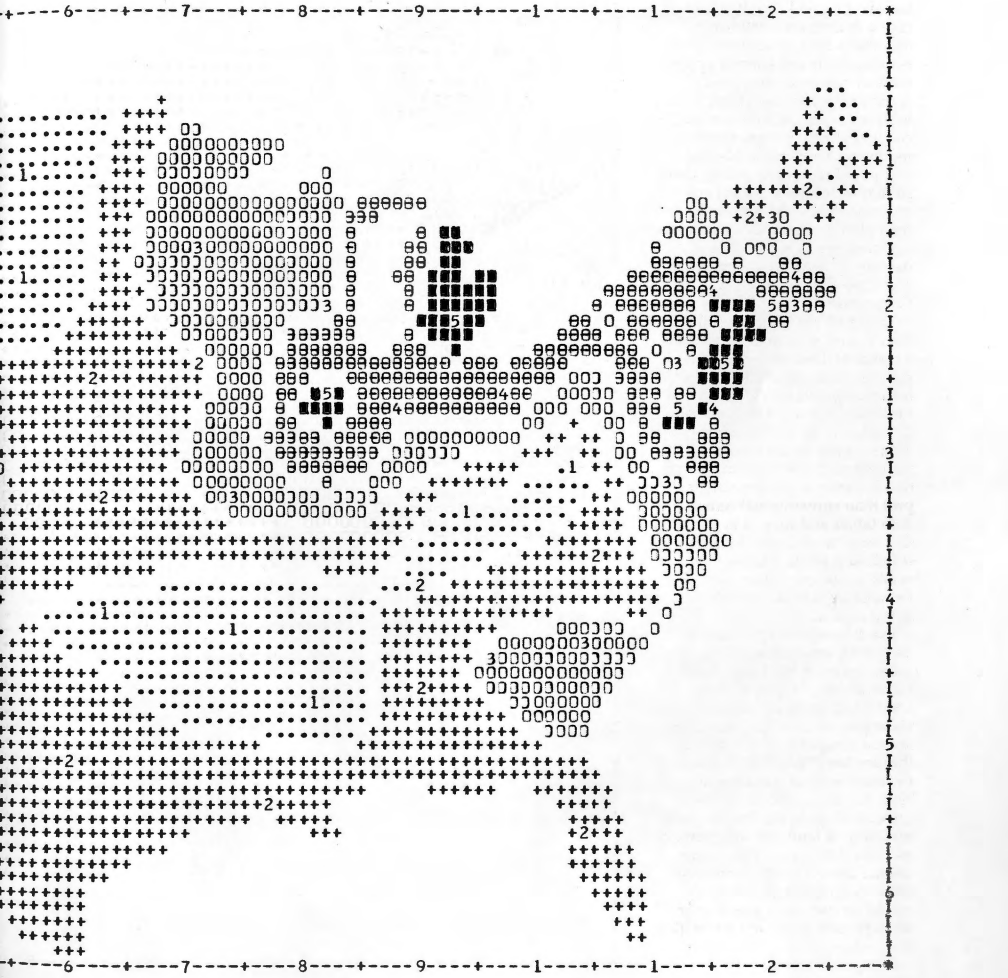
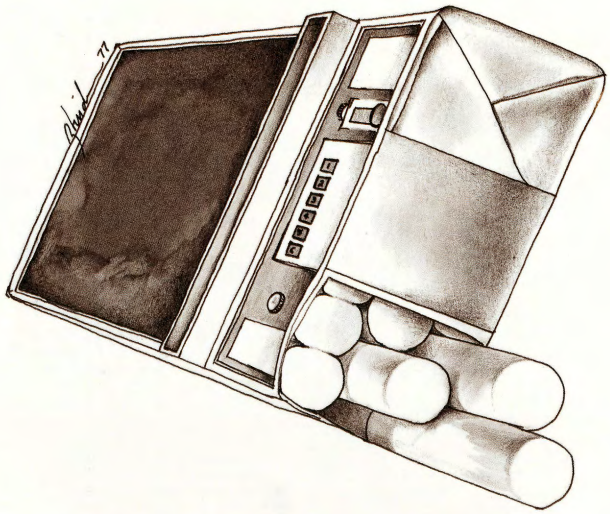


Income regions of the United States, adjusted for racial differences





Warning: Microwaves may be hazardous to your health

Microwaves are increasingly becoming part of our lives. Their impact extends from the international political arena to the household kitchen. Yet we know little of the effect of microwave radiation on health.

Dr. Stephen F. Cleary, associate professor of biophysics, directs several microwave radiation projects at the university. He has been named to a 15 member committee which advises the Food and Drug Administration on radiation safety standards for electronic products used in homes, industry, and medicine.

In the next issue of *Research in Action* he will survey the potential harms of microwave radiation and the need to establish acceptable levels of exposure.

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