

**an urban school  
for district six**

THESIS FOR B.ARCH

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SCHOOL OF ARCHITECTURE

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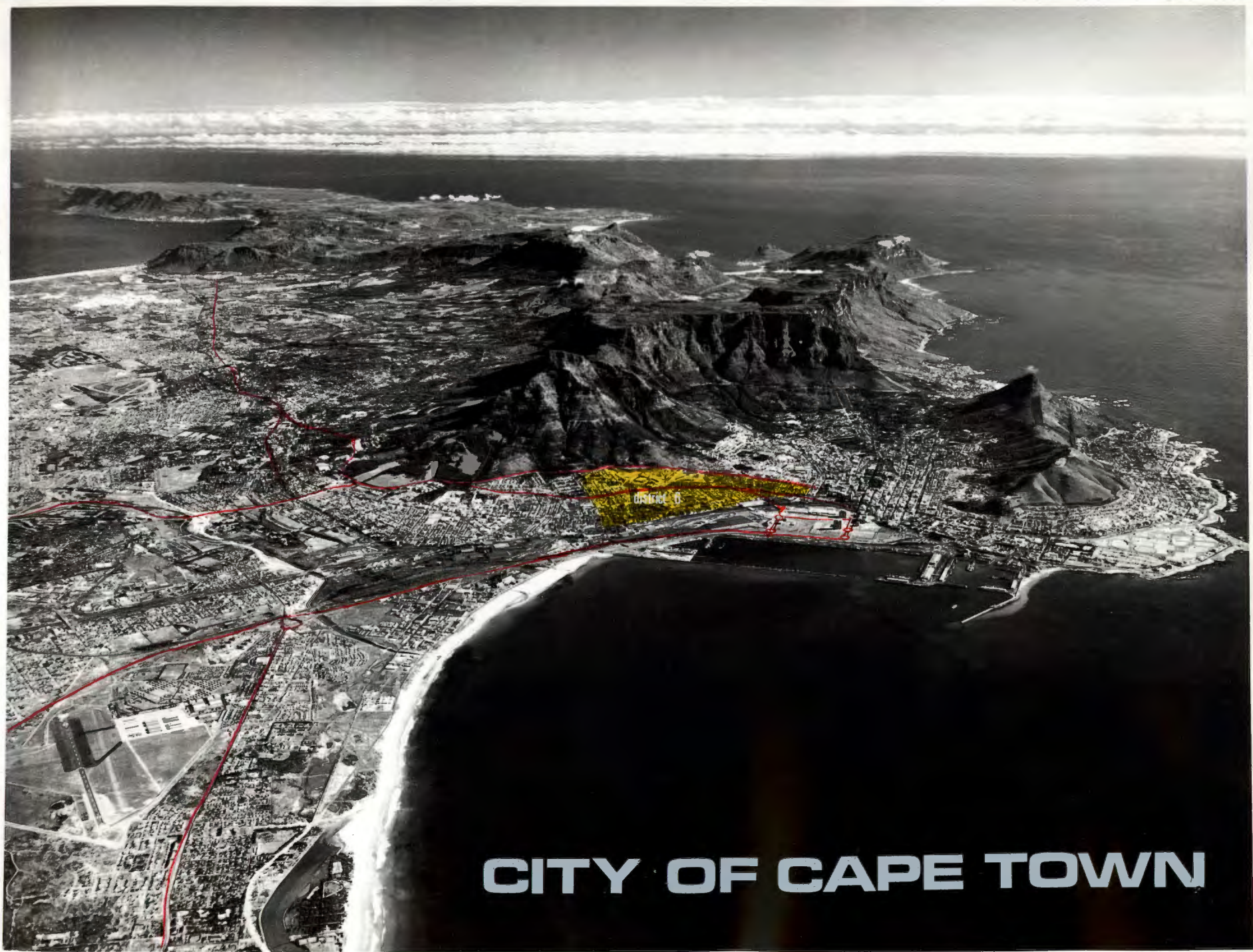
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"The only thing that distinguishes man from other animals is his capacity to create order. From the ability to identify and name things, he has been able to sort them into controllable categories. Once a thing, a bird or flower, has been named it is in our power: we can open a file on it, note its habits and weaknesses, publish a monograph, thus explaining to others of our kind how to perpetuate our control over it.

Primitive cultures knew the power of a name. Those things most sacred were not named, or were given secret or gulling names, which were passed on only to initiates. There are thus two kinds of knowledge: a general and accepted public knowledge which reflects the state of popular education, and specialised knowledge which is particular to a certain priesthood, art or craft."

THEO CROSBY.



# CITY OF CAPE TOWN

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# introduction



Why an urban school for District Six?

The inspiration for this thesis was stimulated by various factors, the roots of which stem from the first term of 1965, when I was involved in a Redevelopment Scheme for District Six. As a student of Architecture, this exercise had a profound affect on me. It introduced to me vital considerations concerning Architecture of which, up until that time, I had only been superficially aware.

It was necessary to study the anatomy of the city, to understand its complexity, before attempting to perform such a sensitive operation as a Redevelopment Scheme. To be one of a thousand designers in "a city of a thousand designers", it is just as necessary to be equipped with this understanding when involved with the design of an individual structure.

This valuable exercise produced results of sufficient

substance and merit to warrant it being carried a step further. The object of this thesis is to develop a school which will take its place in the proposed Redevelopment Scheme.

The role of a school in an urban area such as District Six can be vitally important in cultivating a community within a slum and at the same time transforming it into a new world. A virtue must be made of increasing populations. Outdated suburban standards must be discarded - they have no place in a city. A new set of standards must be created to satisfy the needs of a rapidly expanding Twentieth Century urban environment.

This is the challenge I have set myself.

# **the role of district six in the urban complex**



"When a city begins to grow and spread outward from the edges, the centre which was once its glory ..... goes into a period of desolation inhabited at night by the vague ruins of man, the lotus eaters who struggle darkly toward unconsciousness by way of raw alcohol. Nearly every city I know has such a dying mother of violence and despair where at night the brightness of the street lamps is sucked away and policemen walk in pairs. And then one day perhaps the city returns and rips out the sore and builds a monument to its past."

JOHN STEINBECK  
(Travels with Charley)

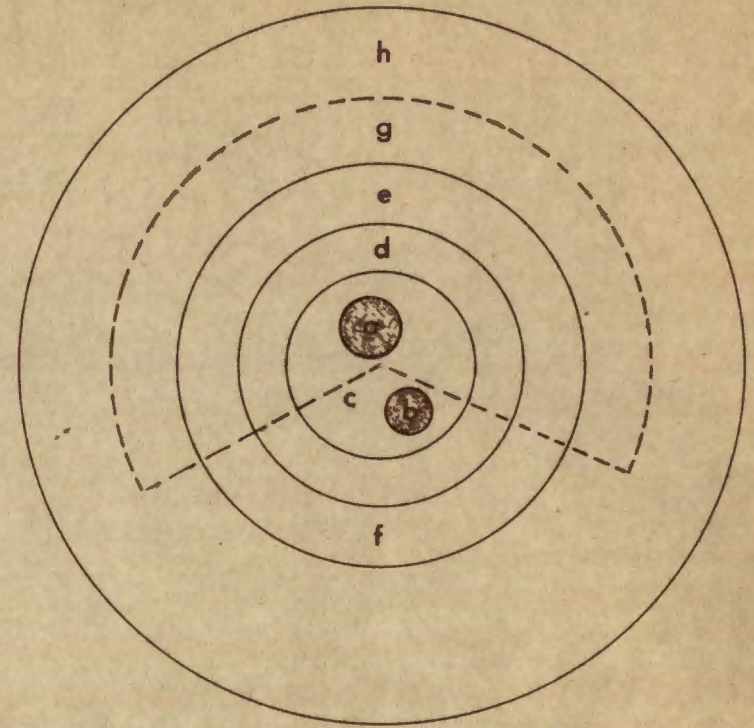
### THE URBAN COMPLEX

The city is man's greatest invention: an "intellectual powerhouse, a store of learning," and of the most diverse energies.

Cities and civilisation are synonymous. The city attracts the talented, the ambitious, the adventurous, the most valuable assets of our society. Their presence and interaction make the city an infinitely varied and exciting place - a mosaic of social worlds.

The individual citizen in the intricate patterned web of the city, is always involved with an infinite variety of contacts each of which produces responses and involvements. These involvements ultimately create social responsibility, and are a most valuable social education. Unless each citizen is able to participate in the complex equation that equals a city, feel himself an integral part of it, and directly responsible to it, his life is negative and he remains undifferentiated.

# the city



- a. THE METROPOLITAN CORE
- b. THE SECONDARY CORE.
- c. THE CORE FRAME.
- d. THE CORE FRINGE.
- e. THE URBANIZED AREA WITHIN CITY BOUNDARIES.
- f. THE URBANIZED AREA OUTSIDE CITY BOUNDARIES.
- g. THE SUBURBANIZED AREA WITHIN CITY BOUNDARIES.
- h. THE METROPOLITAN REGION.

As our society becomes more educated and more specialised, the growth of cities into great combinations is somehow part of our general intellectual expansion. The need for people to be near each other is as old as history. As industries increase in size and complexity there is a greater demand for more skilled and more specialised labour, within the urban framework. This labour force must be close at hand to support the city as in medieval times the walls supported the town. The skilled man has every right to insist on a choice of work and recreation, and workers must of necessity be near their work. The choice is only available in the city, the larger the city, the greater the choice.

#### THE CORE

The heart of the city, the generator, is the most highly urbanised area. This nucleus, sometimes labelled the "Central Business District" or the "Metropolitan Core," should ideally contain a complete range of the highest productivity, and most important urban functions, namely the various

fields of business and civic administration, the cultural, recreational, social and spiritual activities, and residential quarters of high quality and density. The core should provide the best, the most diverse, the rare and the exotic.

#### THE SECONDARY CORE

The "Secondary Core", slightly removed from the Metropolitan core, has similar characteristics of a highly urbanised nature, but being separated, it is competitive to it.

#### THE CORE FRAME OR FRINGE

This is an area of intense development containing secondary urban functions, such as high density residential developments.

These urban neighbourhoods contain multiple housing units related to local commercial, cultural, civic facilities and other urban functions, and working places such as factories having no obnoxious characteristics such as smoke, noise, etc., but

nature and size warrant a place in the urban complex. Their facilities serve the metropolitan core and must of necessity be immediately adjacent to it.

"..... looking at city neighbourhoods as organs of self-government ..... three kinds of neighbourhoods are useful.

1. The city as a whole
2. Street neighbourhoods
3. Districts of large, sub-city size composed of 100,000 people or more in the case of large cities.

Each has different functions, but the three supplement each other in complex fashion. It is impossible to say that one is more important than the others. For success with staying power at any spot all three are necessary."

JANE JACOBS.

THE ROLE PLAYED BY DISTRICT SIX

The part played by District Six in the "Core Frame" or "Core Fringe" is as vital to the city as a healthy

organ is vital to the human body.

District Six is the third of the three "useful" city neighbourhoods Jane Jacobs talks about.

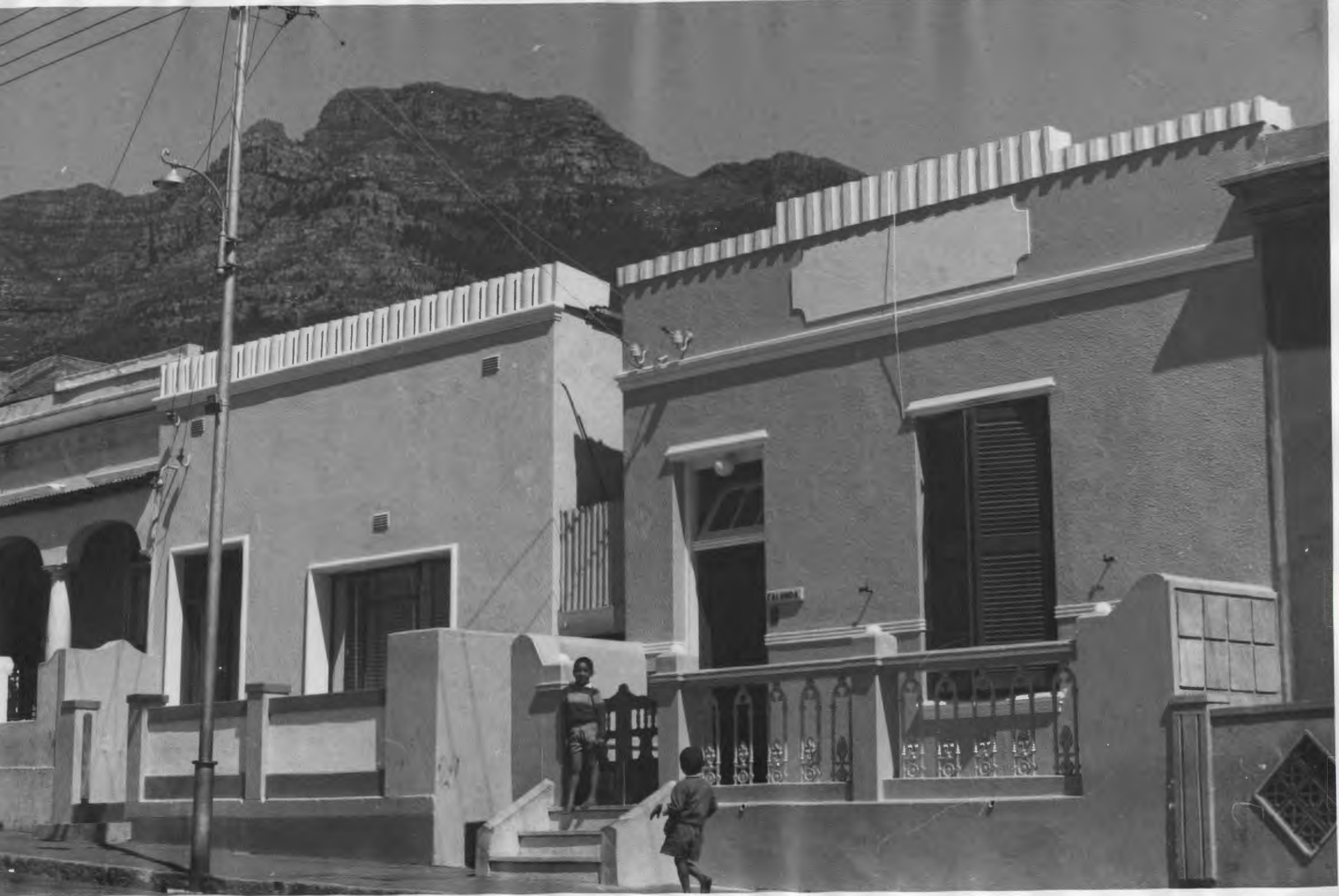
As a proposed high density residential neighbourhood with a low to medium socio-economic population of 115,000, District Six will certainly play a vital and useful part in the future complex of Cape Town.

Each and every individual is needed to contribute to the prosperity of his city, in return to be rewarded for his efforts spiritually and materially. The growth and expansion of industries are always a sign of economic prosperity. Industrial manufacturers are confident and convinced that the importance of the area will increase steadily. Their reasons are clear and concise.

1. Availability of a suitable labour force.
2. Proximity to market.
3. Cheapness of assembling raw materials at cost.



CLIFTON ST





EOAN GROUP  
ISAAC OCHBERG HALL

4. Within the three mile "free delivery" radius of the Culemborg Railway Goods Yard.

District Six is especially suited to light industry where large sites are unnecessary, the trend today being multi-floor factory spaces with commerce on the ground floor. Its proximity to the Central Business District, to the railway goods yard, the harbour, to the warehouses on the fringe of the city and to the labour force within walking distance, are all factors which reinforce its suitability.

The city's capacity for absorbing the skilled and the unskilled is insatiable, more and more young educated Coloureds are filling clerical positions of responsibility, administrative organisations, the Municipality for instance, require thousands of competent employees to carry out its public services.

District Six will have its residential units, its industry, its retail and wholesale, its community functions: cultural, educational, spiritual and

recreational. These ingredients must be mixed with care, the result a useful community in a good urban environment.

Good buildings, good urban and rural environments must be preserved and well maintained. They are socially essential. That is they create the kind of community we need, stable, civilised and constructive. The past is a stepping stone for the future.

**the redevelopment scheme**



The Proposals and Goals laid down in the Redevelopment Programme are the foundations on which this thesis has been developed. It is felt necessary to quote from the report and discuss the various points which directly or indirectly affect this thesis.

#### GOALS

1. That we wish to make the area an efficient "Dormitory" for the city and for the industrial belt.
2. That it is necessary to re-link the area to the city, to the residential zone above de Waal Drive, and to the outlying districts (Woodstock, Observatory, Mowbray, etc.).
3. That we wish to enlarge and improve the industrial belt between Sir Lowry Road and the Railway line, and the general accessibility to it.
4. That we wish to encourage self-ownership, or alternatively subsidised Council development, or private development to conform to certain maintenance codes, thereby eliminating the existing impetus to slumming.
5. That we wish to increase the residential

density, from 65,000 approximately (57 p.p.a.) to 115,000 approximately (100 p.p.a.), to support the cost of the redevelopment, to provide more labour for the developing Central Business District and Industrial belt.

6. That we wish to increase, improve, and, where necessary, reposition, the commercial zones, public facilities, e.g. schools, religious centres, community centres, entertainment centres, libraries, etc., not only to serve the increased population but eventually through greater accessibility to serve the city, and the outlying districts as a whole.
7. That we wish to stage the redevelopment programme in such a way that at all stages of its development it is a meaningful and imageable whole.
8. That we wish to put forward proposals for the reorganisation of controlling bodies and reconsideration of planning restrictions. This will provide more effective tools to develop the district according to comprehensive design procedures within the greater city scale.

#### THE NEW MACROWEB

The central crossover point on Boulevard East at the top of Trafalgar Park, has been used as a link, a hinge point, through which to create movements from the Salt River end to the town end of the area.

Three nodes have been designed, and together with the main roads linking them, are the new macroelements in the area.

#### THE CENTRAL NODE

The central node is the symbol of the community's civic, educational and cultural aspirations. It will contain:

1. Administrative Centre
2. Library
3. Hall complex
4. Theatre
5. Cinema

#### THE TOWN NODE

1. Administration - civic -branch library, etc.
2. Cinemas

#### INDUSTRIAL NODE

1. Industrial Council Headquarters
2. Municipal facilities - clinic, police and fire station, library.
3. Cinema.

### THE NEW SCHOOLS

It was decided to discard the existing land allotment standards laid down by the authorities. These standards are outdated and totally unrealistic in an urban context.

Existing standards laid down by the Provincial Administration:

- a. Schools are established on the basis of one primary school per 600 residential sites and one high school per 1,200 sites.
- b. Classroom accommodation for these is 40 primary pupils per class and 36 high school pupils per class.
- c. Area of ground allocated for new schools is approximately as follows:
  - 4 morgen for a primary school;
  - 6 morgen for a secondary school.

It is clear that if these standards are to be adopted the area of land allocated for the new schools will be such a high percentage of the whole area, that it would be unreasonable and impracticable to plan for the high density population proposed. New standards

must therefore be compiled for an urban context and not a suburban one.

The new population of 115,000 people will have 24,000 pupils of which 18,000 will be at primary school and 6,000 at high school. These will be made up of:

10 high schools  
20 primary schools

It was suggested that at least three high schools be placed in close proximity to the central node, while the remaining two be placed at the other two nodes.

The idea of locating the schools centrally was decided upon so that they could serve the community more efficiently, in that facilities such as halls, theatres, playing fields, etc., could be made use of. It was suggested that the design of the schools take the form of a "cluster" or general "campus" concept.

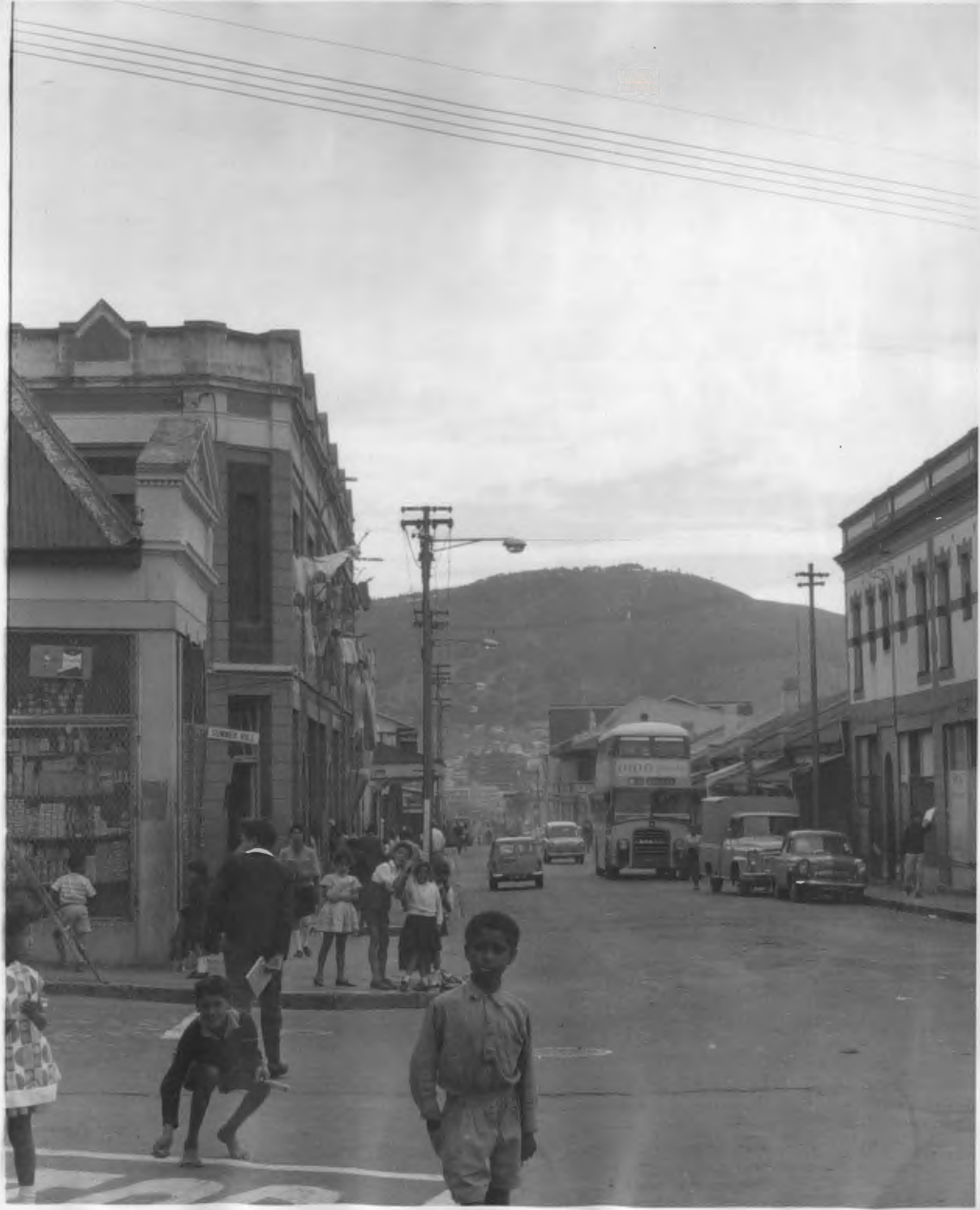
**effects of urban living on children**

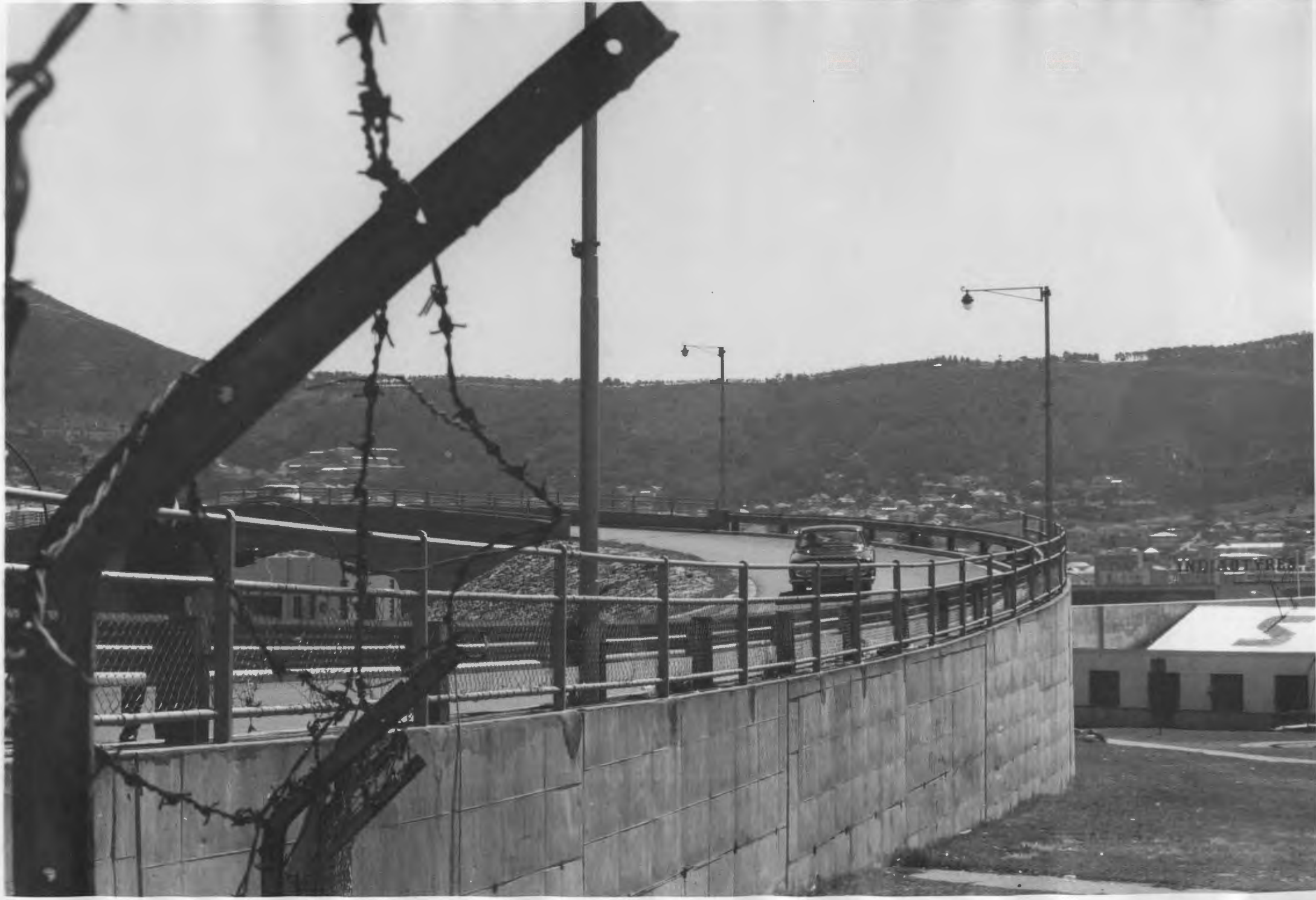


The early social maturity of urban children is a by-product of urban living. Infants are left in the care of their not much older brothers or sisters, sometimes with grandparents, while their parents are at work. Their playground is the street where they are directly exposed to constant stimulation from competing attractions, and all too soon develop an independence and outward self-assurance far beyond their years.

They are left to fend for themselves, darting in and out of traffic, hardly able to carry the newspapers or flowers they sell.

Delinquency is a result of the existing social conditions. Desertion, divorce, alcoholism are rife among the lowest socio-economic groups. The social environment provides little emotional security for the children. Home to the delinquent is an area of the city, corner hangout, or the gang's meeting place. Crime is ignored and even tolerated, for fear of reprisals. Interest in school is minimal and it is remarkable that not more children growing up in this environment become













delinquents.

The urban poor of District Six are unseen, the free-ways by-pass their filthy crowded homes and when away from their homes, their not too shabby clothes deceive us, one can dress reasonably well for little money.

A relatively small percentage of the existing population own their own homes. These are without exception clean and well maintained. Absentee owners control the remainder of the residential buildings, tenements, terrace housing and shanties, and are blind to the disgraceful conditions their tenants live in, knowing full well that they fear eviction if they were to complain.

Such conditions attract transients, those who cannot work, or, "die wil nie werk nie's", the unskilled and the unschooled, the unemployed and the distressed families whose bread-winners have been imprisoned or committed to mental institutions. The only possession they have is children. The school's primary





responsibility is that of instruction but when a teacher is faced by a barefoot, hungry, sick and distressed child, an endless chain of efforts to relieve such a child results.

"It is ludicrous to think that with any amount of effort, official or unofficial, even a tolerable school is possible in a neighbourhood of such extreme instability. Good schools are impossible in any unstable neighbourhood with high pupil turn over rates, and this includes unstable neighbourhoods which also have good housing."

JANE JACOBS.

The fact that over a thousand children of infant school-going age cannot find a place in the existing schools is most alarming - virtually in every individual case their parents want them to attend school.

The adolescent's absence from school is a problem with roots of another source. The secondary schools

number only a fraction of the total primary schools. The teenagers more often than not are forced to find work in offices, factories, hotels and restaurants, and at sea. Sometimes this is of their own volition. The independence gained through earning a salary provides the necessary escape from the sordid environment they are exposed to. There are those who, forced for economic reasons to leave school, regard this initially as temporary and are desirous of continuing at a later date, only to find this intention weakened by having the material extras of a salaried person.

**the existing  
schools  
in district six**



POPULATION

There is a total of twenty-seven schools in District Six, covering an area of about twenty-three acres.

3 Nursery Schools	235 pupils
14 Primary Schools	6,827 pupils
8 Primary/Secondary Schools	3,710 pupils
1 Secondary High School	634 pupils
<hr/>	<hr/>
27 Schools (total)	13,406 pupils

The present population of District Six is 65,000, but the total figure of 13,406 pupils attending school is not truly the reflective position of the present population, as a large percentage of the pupils are drawn from other areas such as the locations on the Cape Flats; Athlone, Hazendal, Bishop Lavis, Crawford, Grassy Park and Bonteheuwel, to mention a few, as well as the neighbouring commercial and industrial areas of the Malay Quarter, Walmer Estate, Woodstock and Salt River, and as far afield as Paarl, Strand, Wellington, etc.

There are many well founded reasons why these pupils



**EXISTING SCHOOLS**





CHAPEL STREET  
SCHOOL

GIRLS

**CAPE S.W.  
DISTRICTS**





travel extensive distances each day to attend school in District Six. The enforcement of the Group Areas Act has resulted in a recent gradual depopulation of the area, and families have been forced to seek new homes elsewhere. Parents feel that their children should continue at schools where they commenced their education. Also they feel, and rightly so, that the standard of education is higher than in the newly-established or local schools. This is in most instances the case because there exists a critical teacher shortage and the qualified teacher prefers the city because of its convenience, and invariably higher wages, especially in private schools, are an added attraction.

To a lesser degree, sentimental reasons may influence a parent's decision to send his children to his "old school". A parent working in the city may have a more practical reason, that it is more convenient for him to leave his children at school or a crèche in the area while at work.







### CONDITIONS

The existing schools are evenly distributed over the entire area. Generally speaking the present facilities are grossly inadequate and the conditions very poor. They experience desperate financial problems. They tend to be old, decrepit and in need of replacement. Equipment is out-dated. Some have been expanded by various makeshifts to house far more pupils than they were ever intended to accommodate. School enrolments have grown, more children are going to school and staying there longer than ever before. Urban schools have become overcrowded, the classes are too large, special services are virtually non-existent. Teachers are subjected to strained conditions, not being able to give enough individual attention to pupils. There are, for example, a thousand children of infant school-going age who are unable to gain admittance to any school. The majority of the pupils leave school before reaching a secondary level to find work in factories and other employments.

The suburbs have robbed the city of people who payed









CAPE SCHOOL BOARD  
KAAPSE SKOOLRAAD  
Twee sessies maandliks  
om 12 en 18 uur











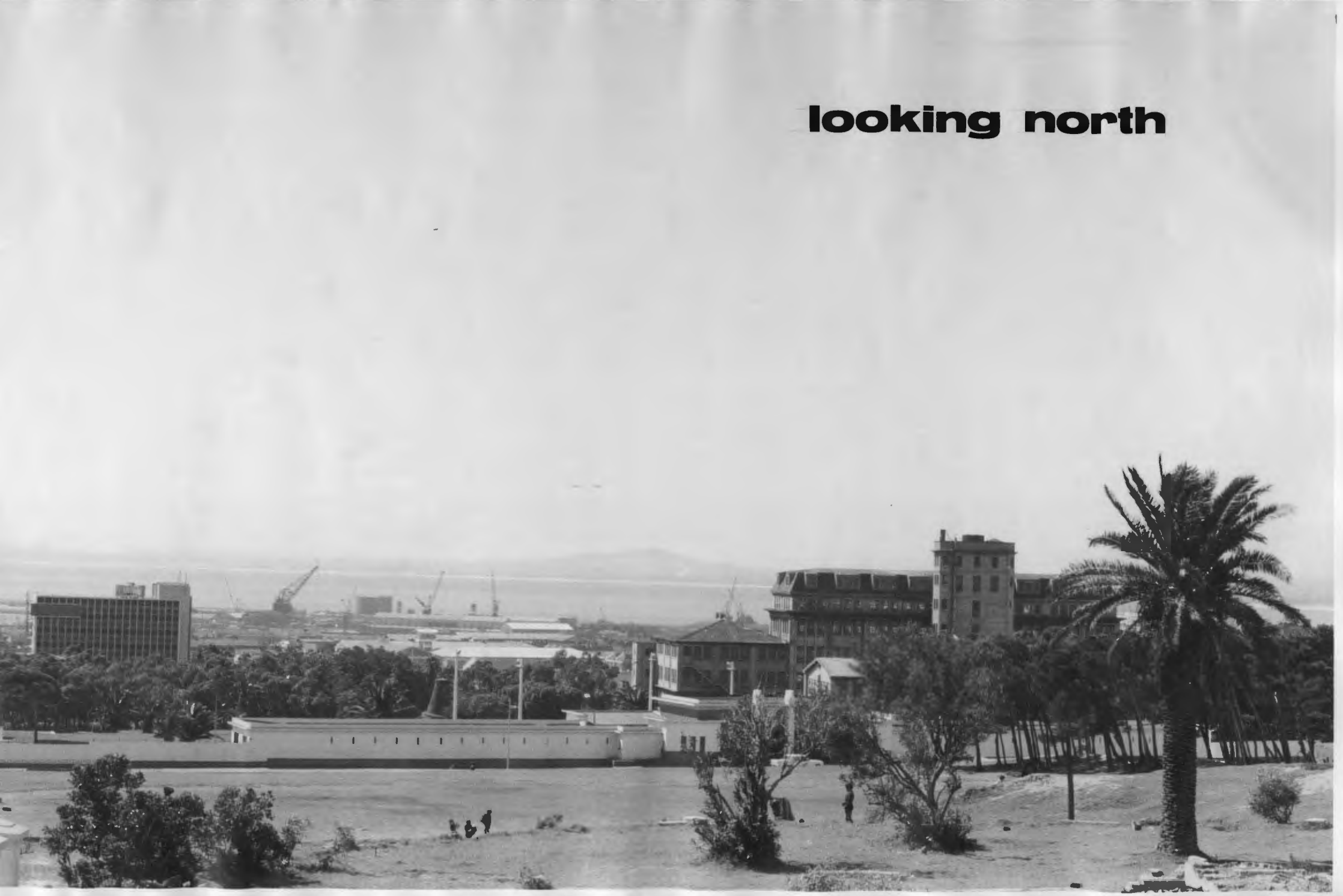
high taxes, the suburbs have strained the city's financial resources by requiring improvements of transportation facilities, highways, and parking areas. Money spent per pupil in a city school is likely to be only half as much as is spent per pupil in the wealthier suburban schools.

Better schools are not enough to solve the problem of the urban poor. They will always be with us unless the best brains and a substantial share of the country's resources are combined and channelled into a concentrated attack upon city planning and the roots of poverty.

**the site  
looking south**

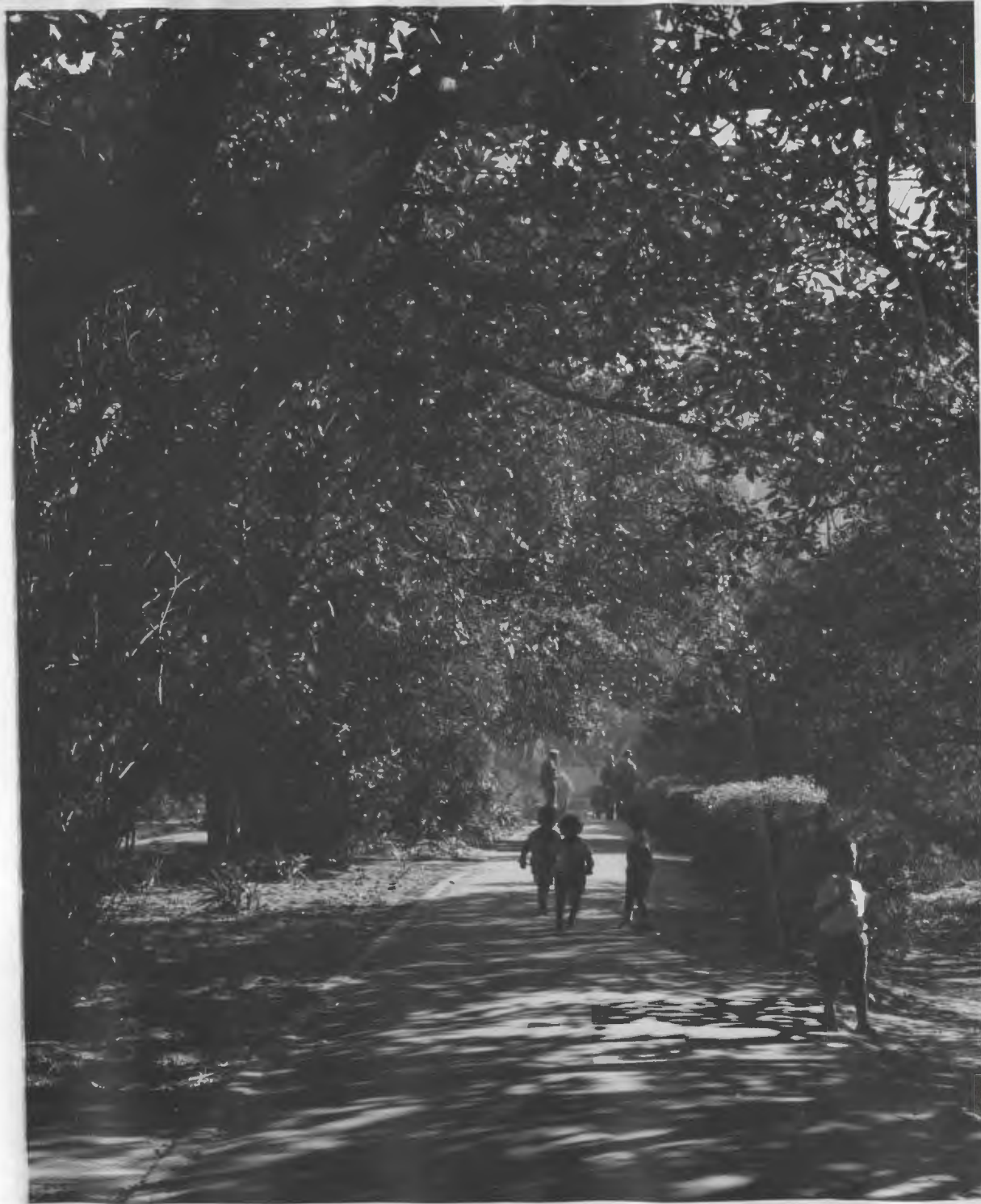


**looking north**



# **the choice of the site**

**trafalgar park 'gardens'  
pedestrian link  
from station**



### REASONS

With the basic proposals of the Redevelopment Scheme for District Six in mind, it was an obvious choice to locate the most important Secondary School next to Boulevard East, where the proposed Central Node is to be sited.

Boulevard East, a foreign element and almost entirely unrelated to the area, bisects it into two. It is important to create cross-over links between the two sections, otherwise their respective characters are likely to take on an even greater degree of isolation than that which exists at the present time, and develop into static ghettos. When referring to links, it is not only the physical links such as bridges, underpasses, etc. that are required, but links of intercommunication of activities and functions. Structures on either side of Boulevard East will provide the necessity to traverse from one side to the other. The central Node will provide for a great deal of activity and, as the main structural image of the community, it will promote an intercourse of movement between the two sections



**the new face**





**next door**

and in so doing tie them into a cohesive whole.

The School will be directly related to the Central Node and as a structure will play an important part in the complex. Its community functions warrant its place in the heart of the community.

Ease of access to the school by pupils and adults, in fact by the community, is another consideration. Centrally situated it is within an average radius of three-quarters of a mile, a comfortable walking distance, and it is close to the main bus routes. The decision to site the school on the sea-side of Boulevard East was further endorsed by its proximity to the Salt River Station, where the out-of-town students would arrive.

The open space image of the speed element of a highway, together with nearby Trafalgar Park, and playing fields, provides a badly needed breathing space for the school in a densely built-up area.

**the new approach education**



#### A CRITICISM

All developing countries are only too aware of the drastic teacher shortage, overcrowded classrooms, inadequate buildings, textbooks, and teaching-aid supply difficulties, the anxieties of budgeting on a very limited income, and an expanding birth rate coupled with decreasing child mortality.

The system of Education practised today has hardly advanced from that of a century ago.

"Traditional teaching methods tend to be too slow and haphazard for the twentieth century. A teacher addressing a class is a point source of information who is too dependant upon the characteristics of his environment for guaranteed effectiveness. Room acoustics, random noise level, the timbre of his voice and ability to command attention, the legibility of his handwriting on the blackboard, all affect learning efficiency - however good the teacher."

F. PAUL THOMSON.

symbols



direct

concept

school room

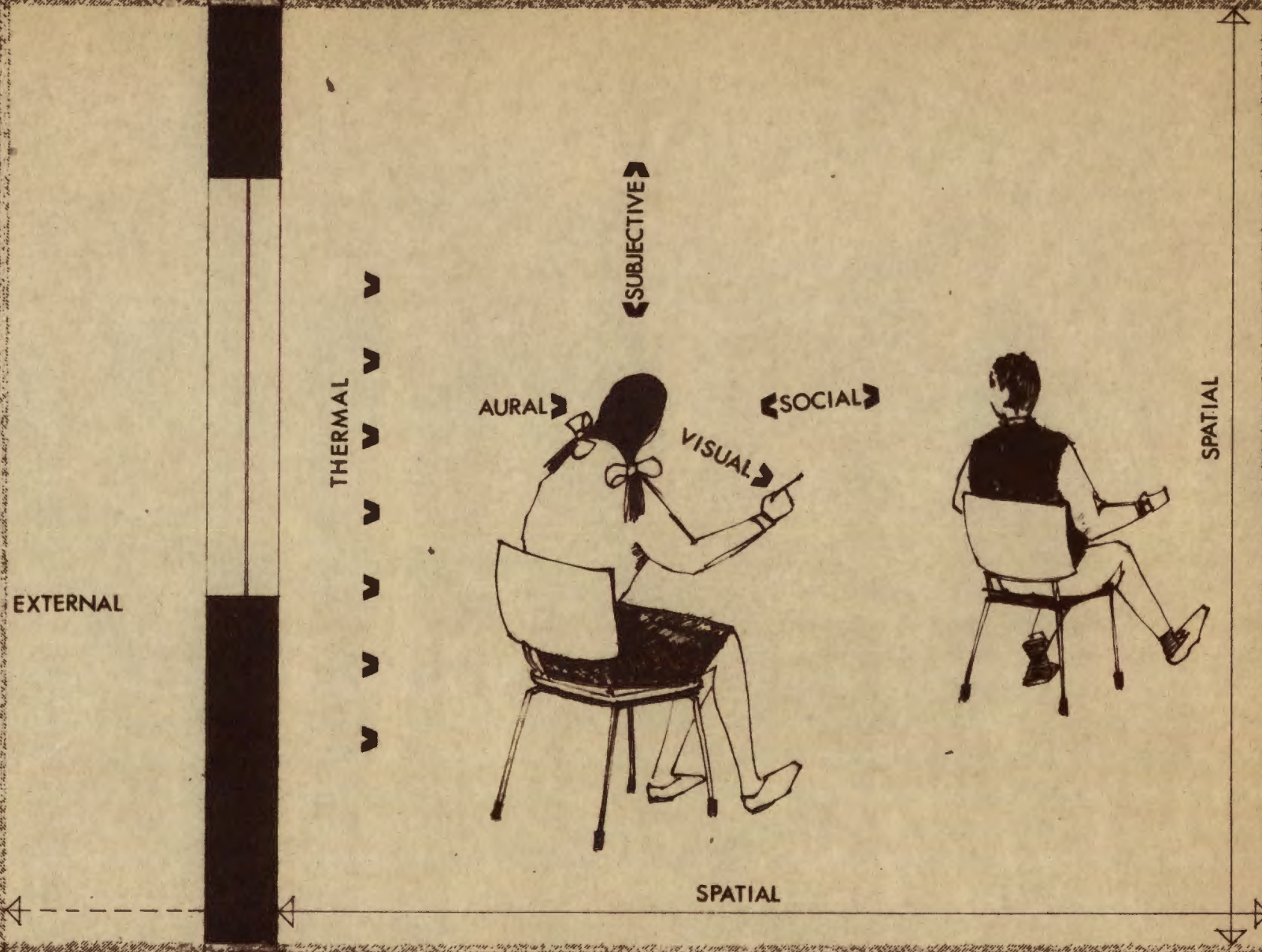


teaching

"It is ironical that the fruits of education - its sciences and the technologies - were not mustered earlier for the betterment of educational method."

Since the Industrial Revolution, man has created mechanical devices, ranging from the first steam engine to the latest electronic computer. These have steadily replaced human hands in industry, commerce, communications, transport and many other spheres. Now it seems to be the turn of education. Talk and chalk are giving way to audio-visual, mechanical and electronic methods of education. The demands made on educational authorities have outstripped their ability to cope with problems in orthodox ways, with the result that many new experiments are being carried out - some with startling success - in an endeavour to improve mass instructional methods without simultaneously producing mass indoctrinated minds.

If educational demands of the present and the future are to be accommodated, organised campaigns by groups



**environment**

of experts including psychologists, educationalists, architects and specialists in the various subjects and in audio-visual presentation, must co-ordinate to establish a new economical and practical system of education which is so vital to the nation's growth and prosperity.

The centuries-old concept that the role of the teacher must be the dominating factor in the classroom is changed with the new philosophy. The teacher assumes the role of a tutor, within a team of tutors, and the pupils work individually and in groups, unable to be lazy or undisciplined. The pupil has more responsibility to himself, his fellow pupils, and the teachers. The teacher makes a more efficient use of his time.

Textbooks are usually written by specialists without any teaching ability. They require the pupil to work through dull exercises that he might already have mastered. These can be replaced by a programme prepared by a team of specially trained

teachers.

The art of learning has always been the problem of the student. The new system of education must be presented in a form so as to involve the student in the learning process to the maximum possible extent.

# planning

## GENERAL

The new school must satisfy four essential requirements. First, it must accommodate groups of various sizes, for teaching today requires a reordinating of teaching personnel relationships and concurrently both make possible and assume a reordering of the basic instructional groups. The standard rows of 800 or 900 square feet classrooms no longer can accommodate the requirements of teachers and pupils. Wherever one tries to bring several classes together, or to break a class or series of classes into smaller units, the traditional classroom stands in the way. Designed for 25 to 30 pupils and one teacher, it simply does not fit the continually changing requirements of flexible re-grouping. Depending on the particular organisation and size of the teaching project, spaces are needed to accommodate from two or three pupils, studying together or separately, to 100 or 200 pupils participating in a large group presentation.

Secondly, not only may the groups be of varying sizes, but they may also change continuously.

Thirdly, they should provide a place for teachers to work both in small groups and in private. The teacher is no longer operating alone; his work is part of a larger scheme and his responsibilities shift from day to day. Planning, studying and conferences with other members of his team, he needs materials, resources and equipment which are apt to be more varied than those to which he has been accustomed. His classroom can no longer serve as his office. It is no longer "his". His planning is continuous whenever he has no teaching or observational duties; he is no longer limited to a traditional free period a day in his own room; he needs space to work, to plan and to organise materials which his greater specialisation and released teaching time both require and enable him to prepare.

Fourthly, more and more pupils tend to be on their own doing independent work, proceeding at their own best pace. Their group may no longer be 25 or 30. Demands for space and for study spaces where students can work on a paper or a laboratory experiment and

where they can leave their work until they have finished their research. Libraries become busier; listening booths are used more frequently; laboratories are equipped with space for individual projects; and individual cubicles, in libraries or placed in nooks and crannies or along a corridor wall of varying width, are emerging as necessary spaces.

#### FLEXIBILITY

EXPANSIBLE SPACE: space that can allow for ordered growth.

CONVERTIBLE SPACE: space that can be economically adapted to programme changes.

VERSATILE SPACE: space that serves many functions.

MALLEABLE SPACE: space that can be changed "at once and at will."

Each of the three latter kinds of flexibility possess characteristics which are useful and in some ways necessary for the new school design. Of the three, convertible space is usually thought of but, unless a school which is to be convertible is most carefully

planned for lighting and ventilating, and unless the spaces when altered are efficient in shape and size with appropriate acoustics and exists, it may remain such only on the architect's blue print.

Three classrooms can be converted into one by removing two walls, but the resulting long, narrow room may be very inefficient for the new purposes for which it is to be used.

#### PLANNED VARIABILITY

In contrast to approaches which seek to provide convertible space or malleable space is the approach which attempts to build into the structure itself basic spaces of different sizes and types. This approach, sometimes referred to as planned variability, implies that enough is known about the re-ordering of student groups of varying size and purpose. It further assumes that these spaces will be used regularly enough to ensure their occupancy for a large percentage of time in the course of a school day or week. This does not mean, however, that the

programme must fit into a rigid series of spaces of different size, for convertibility can be and sometimes is built-in, through the use of a limited number of movable partitions or easily removable non-bearing walls.

This type of plan is based on the premise that spaces be designed especially for them and should have properties peculiar to the type of instructional activity which each requires.

The educational programme on which the architectural solution is based is first translated into time units for each of three sizes of instructional groups: seminar groups of 10-15 pupils, laboratory/classroom groups of 25-30 pupils, and large groups of 125-150. From these time equivalents, the number of spaces for each size of group is determined.

For a school of 1,000 pupils students time follows a time pattern of 20% in large group work, 60% in laboratory/classroom, and 20% in seminar groups.

For this number two large instructional areas would be needed, along with 18 laboratory/classrooms and 17 seminar rooms.

A school can be planned to move from a programme of traditional education with groups of 25-30 to one classroom, to a programme with the emphasis on seminar and large group work.

PRECEDENT

WAYLAND HIGH SCHOOL, WAYLAND, MASSACHUSETTS, U.S.A.

Schedule of Academic Spaces Required at Various Stages of School Growth and Programme Development.

STAGE	TOTAL NO. OF PUPILS IN SCHOOL	LARGE GROUP INSTRUCTION			LABORATORY CLASSROOM.			SEMINAR		
		A	B	C	A	B	C	A	B	C
V	1200	1	2	3	28	21	14	11	21	32
IV	1000	1	2	2	24	18	12	9	17	26
III	750	1	1	2	18	13	9	7	13	20
II	600	1	1	1	14	10	7	6	11	16
I	450	1	1	1	11	8	5	4	8	12

A (TIME) = 10% large groups 80% standard class/lab.  
10% in seminar

B (TIME) = 20% large groups 60% standard class/lab.  
20% in seminar

C (TIME) = 30% large groups 40% standard class/lab.  
30% in seminar.

Wayland was built initially for stage III. To accommodate the lower enrolment of 450 pupils it was necessary to modify only two blocks of four seminar

rooms so as to provide two areas for 30 pupils each instead of four eares for 15 each. These spaces were so designed for access and utilities that they may be easily partitioned into eight seminar rooms when stage III of the programme is actually reached.

Academic Programme Spaces Required at Wayland Senior High School

		LARGE GROUP	LAB./ CLASSROOM	SEMINAR
I-A	450 students 10% large group	1	11	4
II-B	600 students 20% large group	1	10	11
III-C	750 students 30% large group	2	9	20

The school was planned and built with a focus on academic centres. Each centre has a study-resource area and space for individual offices for teachers. Spaces are designed for specific functions, and the number of such spaces was determined by a careful programme analysis.

The most carefully planned areas are the library resource centres and the large group instructional rooms.

In Wayland, in addition to the central library, which is viewed as the main repository of resource materials, there are in each academic unit decentralised resource-study areas where most of the currently needed books, magazines and materials are available. Since the teachers have their offices here also, the centre serves as a general workshop, study, and conference area.

The Library can be flanked by individual study areas equipped both with space for reading and with booths for listening to tapes.

The assembly-lecture halls are designed to accommodate the students in semi-circular fashion behind rows of long tables placed on raised tiers. These rooms are not conceived of or used solely as traditional lecture halls, but are designed for all the various kinds of large-group instruction-demonstrations, audio-visual

presentations, and certain kinds of discussion. These areas are fully equipped, specially lighted and ventilated, and entirely enclosed in order to use film projectors.

#### PLANNING EFFICIENCY

In all probability schools are not going to be less expensive if they provide the full range of necessary spaces and equipment needed to make this type of instruction most effective. They may be more efficient schools, they may make possible better learning conditions, but a by-product of lower construction cost per pupil is probably not to be expected. The measure of the new school is in the provision of spaces, equipment, and a general quality of environment which makes possible a better programme of instruction.

#### ACOUSTICS

Problems exist with open plans - and planned variability. The control of sound is an intricate engineering problem. Sound bounces off hard

surfaces, goes around corners and under doors, penetrates rigid partitions and flows through duct work. Sound can be controlled, but the problem is the cost, and another problem is to define just what noise means in a school and when and under what conditions it is disturbing. Pupils get used to the constant overtones of movement and noise, but what is the fatigue factor which may be accompanying this concentration?

Research has been conducted in developing various types of acoustically effective movable walls, but the estimated cost is five times that of traditional brickwork and plaster. There is an indication that within the next decade or two the rise in cost of building materials and labour will balance out the cost of sound-controlled partitions.

#### CONCLUSION

Whether or not the quality of the environment which has been created has a direct affect on learning has not as yet been scientifically established, but the

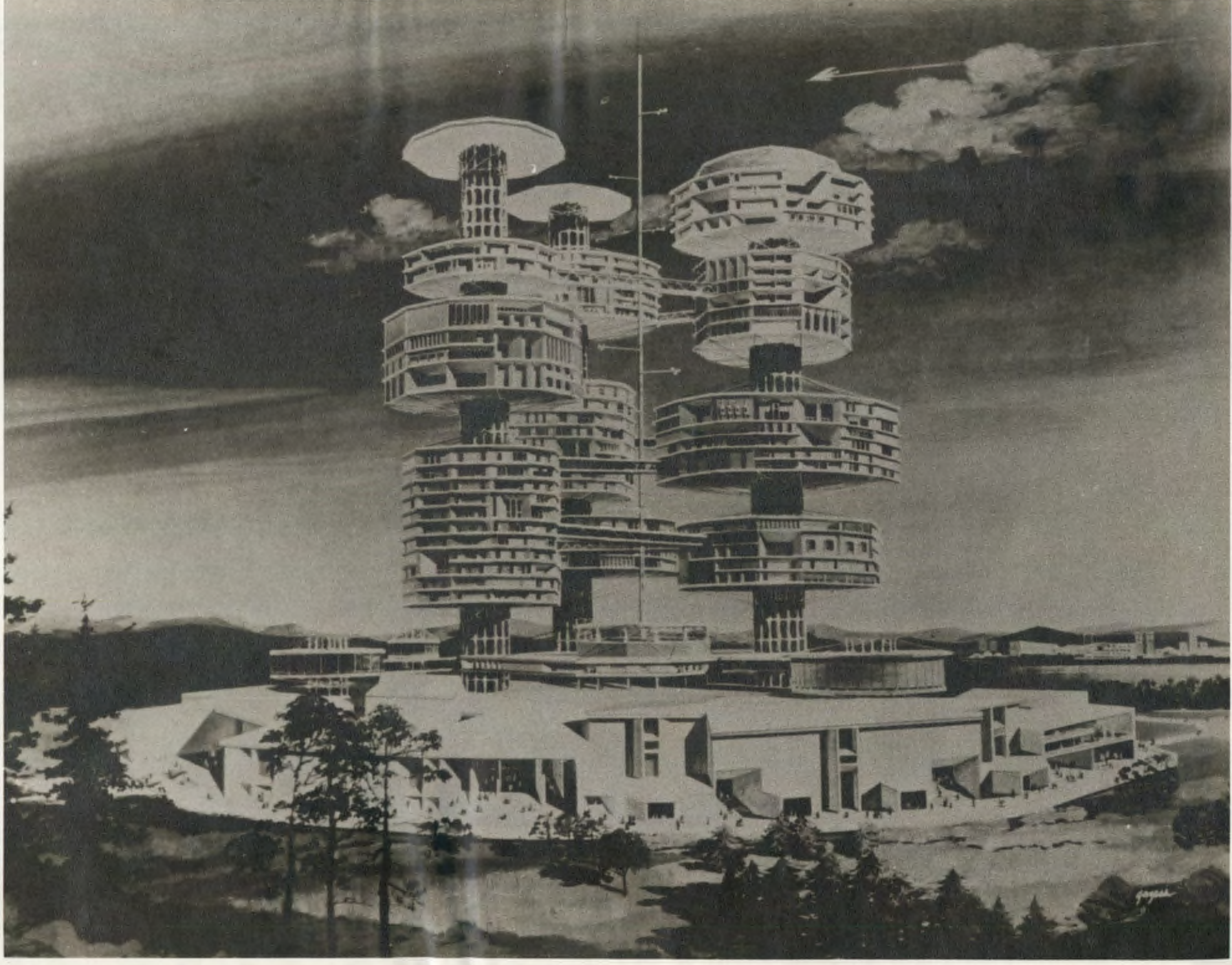
belief that an environment which shows respect for students is one which will not only be satisfying to them but will also encourage better work and learning remains strong.

The new school provides an opportunity for a community to express in physical form its intent toward its children, and each new school can be as productive, as attractive, and as convenient as any other building in the community.

"Educational innovations will demand architectural solutions far beyond the mere installation of accordion doors and multi-purpose rooms. Most of all it will take close and continuous collaboration between educator and architect to achieve the varied arrangements of space the new educational methods require and to keep the plan under constant review.

(Educational Reform and its Architectural Implications  
PROGRESSIVE ARCHITECTURE : August, 1965.)

**precedent**



### THE SCHOOL OF TOMORROW

In the United States, the leading educators, architects, engineers, designers and communications experts have been peering into the "time telescope" to foretell the future guise and function of the school. Working together in teams they have come up with bold imaginative concepts to deal with the demands of education as related to the rapidly expanding population of children and adults.

Guided by educators' comments, architects have designed a highly compact school to serve as a total community centre accommodating 60,000 persons. It combines the ingredients of elementary and secondary school and college, home study, library, performing arts centre, museum, health and recreation centre, settlement house, civic auditorium and many other community facilities.

Starting with a multi-unit base, approximately 800 ft. in diameter, the school of tomorrow they envisage will feature three towers varying in height

to 500 feet and interconnected with walkways at different levels. Buildings constituting the base would be used for theatricals, lectures, concerts, exhibits, conventions and recreational activities of all kinds.

These towers contain and support circular multi-storied units which house three specialised learning areas:

1. Human Resources Centre
2. Science Tower
3. Cultural Media Centre.

Most of these towers will be windowless, thus providing completely controlled environments for maximum concentration on learning tasks. But there will also be balconies or open air terraces where students, after hours in a controlled environment, can step outside and relax.

The School of Tomorrow will have automatic control of the climate, colour, light and sound in its rooms.

Carpeting will dampen sound, furniture will be functional and comfortable, there will be no crowding, lighting will not strain the eyes, acoustics will be perfect, thus, by the year 2000, schools will help the child to see better, hear better, feel better and learn better.

Besides the towers, other structures rise from the roof of the lower element of the School of Tomorrow. One of them will be the Demonstration and Experiment Centre. It will be used to record audio-visual programmes to be stored in the Electronics Centre.

The Electronic's Centre will function as the school's library, but its information will be stored magnetically rather than in printed volumes. This will permit virtually instantaneous access to any desired portion of a book. Every kind of audio-visual teaching material will be relayed direct to any classroom or laboratory.

In the Introduction Centre, pre-school and primary

grade children between the ages of 3 and 7 will be provided with a smooth transition from the home to the community.

The Ecological Centre will combine a miniature museum, zoological park, and botanical garden. The entire family will be able to participate in leisure time activities in the Physical and Health Fitness Centre. There will be an all-weather sports arena with a retractable dome that can convert an outdoor sports event into a closed stadium.

Visiting students and teachers from other areas and from abroad will be accommodated in the Guest House.

The School of Tomorrow will serve not only children from kindergarten through college, but teach adults as well. With the possibility that the work-week in the United States by the year 2000 will be less than the present 40-hour period of today, adults will have more spare time. Educators believe that they will therefore make use of their free time for

education.

Unlike the schools of today which are open 8 or 9 hours a day, five days a week, and nine months of the year, the School of Tomorrow will be open 24 hours a day and 52 weeks of the year.

The School of Tomorrow will furnish courses and programmes specifically designed to prepare students for the problems and challenges they will face as adults:

1. The need to compete for job opportunities;
2. Their responsibility as heads of families;
3. Their responsibilities as citizens.

The "study sphere", a space-fictional type of equipment, the Americans believe will exist in the year 2000, will be an opaque spheroid six feet in diameter. The student will step into the "Study Sphere" and lock himself in for a disturbance-free atmosphere. It will be equipped with antenna

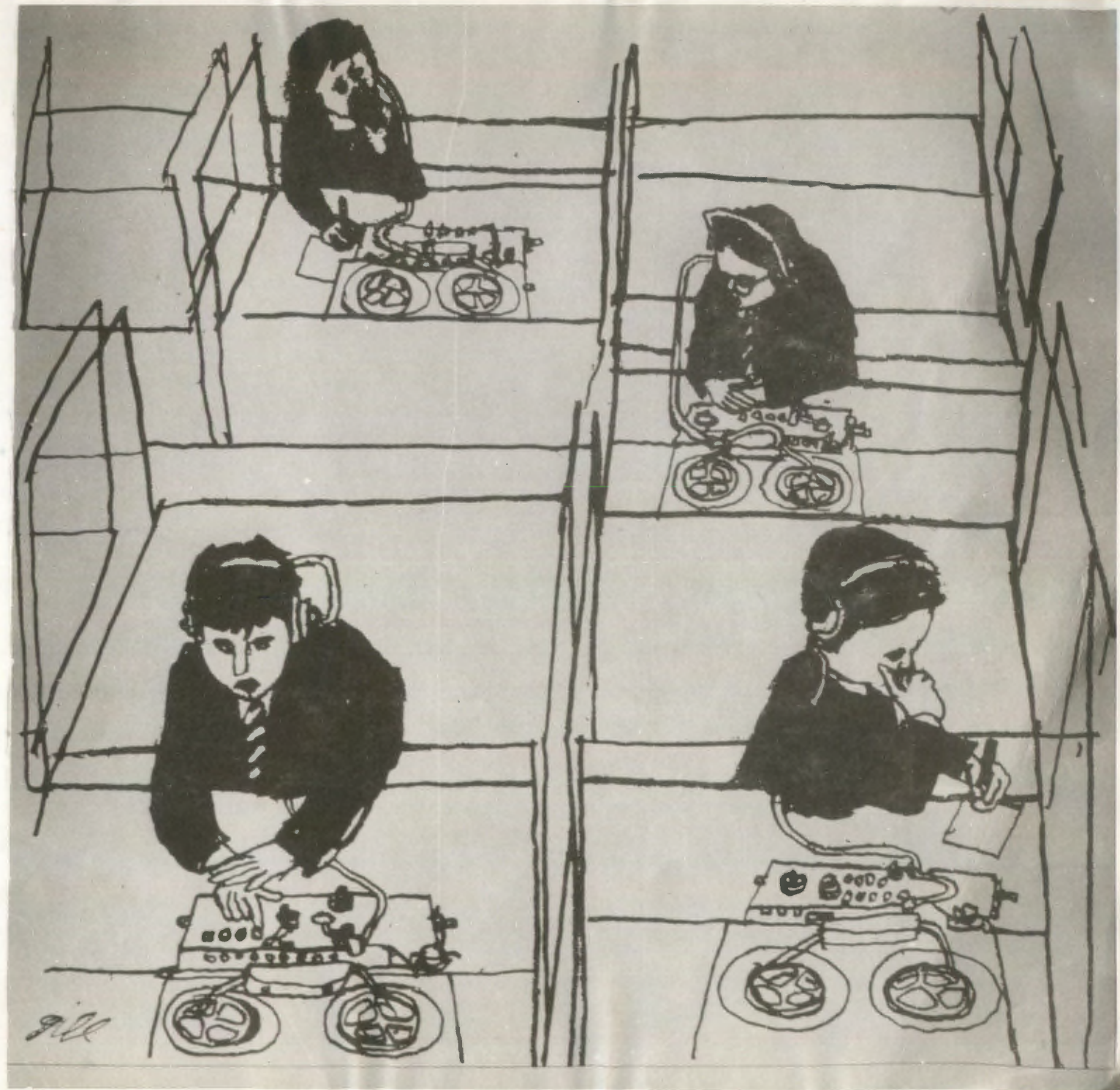
enabling the student to receive audio-visual signals from all over the world, including signals "bounced" off the moon. The student will be able to control the temperature and the ionized air. Inside will be a small television and film screen, a microphone, tape cartridge insert for recording and playing back taped materials, stereo-speakers, ear plug receivers, controls for a built-in computer, a light-sensitive writing desk and an instant printing device, typing keys and an adjustable seat.

The Space Age has in no uncertain terms begun, technology races on at a terrific speed, gathering momentum as it grows and advances into the future - man cannot keep pace, his evolutionary progress is a slow one, but if he is to survive his brain must develop at a faster rate to control and harness the tremendous powers he has created. Will this veritable wonderland of electronics solve the problem of the future? If one adopts a purely objective approach, casting scepticism aside and bearing in mind the present wonders (or monsters) of technology, can

one doubt that this will be the case? Where will the  
human element fit, in this new world?

# special study

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### AUDIO-VISUAL AIDS

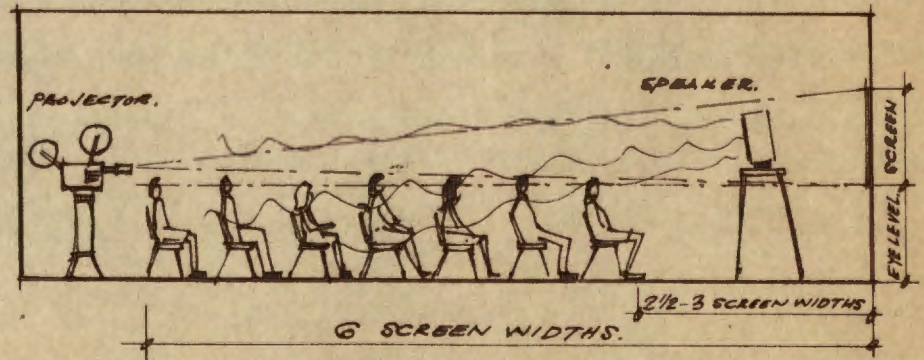
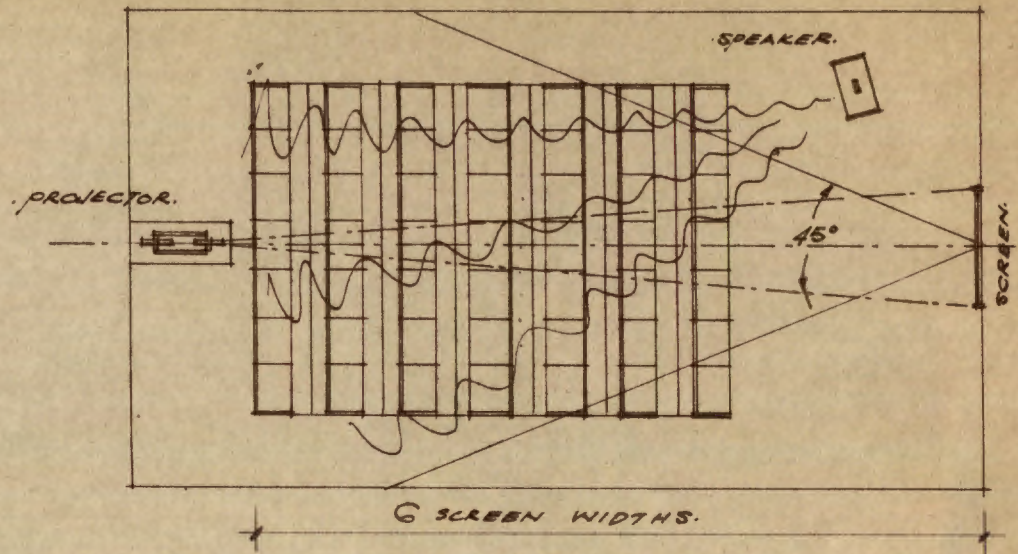
#### ELECTRONIC LEARNING LABORATORIES:

These include recording, playback, and listening equipment which make it possible for a student to listen, speak, hear, and record his voice. The teacher may control listening and student participation through an electronic console, or choices may be available to students at each station. The electronic learning laboratory was originally designed to serve foreign language instruction. A broader utilisation is possible on all grade levels for experiences in speech pronunciation, literature and music appreciation, mathematics "drill", typing and shorthand dictation, and various other subjects.

#### MOTION-PICTURE PROJECTORS AND FILMS:

Sixteen-millimeter motion-picture projectors have been a standard tool for teacher use for many years. Films cover almost every subject, films that treat a single idea or concept in depth for a specific audience, illustrate a specific process, or demonstrate an applied principle.

FILM PROJECTORS



The developments and refinements in equipment, such as easy-to-operate self-threading projectors, or projectors that accept cartridge units, now permit anyone to work the projector and show films to groups or for his own self-instruction. Also, with the advent of sound projectors for 8-millimeter film, new possibilities for inexpensive materials are opening. Eventually less expensive prints of films may be produced and deposited with an individual school as part of its instructional materials resources.

#### OVERHEAD PROJECTORS AND TRANSPARENCIES:

These projectors offer tremendous potential for improving and increasing classroom communication within a small group or before a large class. Because it is used near the front of a room, with moderate lighting, and the instructor faces the class while pointing to features on large transparencies, the overhead projector is receiving increased attention. Difficult concepts may be presented through step-by-step disclosure or by the addition of overlay sheets to a base transparency. Three-

dimensional transparent objects or silhouettes and even simulated motion can be shown.

#### OPAQUE PROJECTORS:

These projectors, using the principle of reflected light, project many materials in their natural colour and appearance - single sheets, mounted pictures, magazine and book illustrations and small three-dimensional objects. The materials require little or no preparation before use. Besides projecting materials for examination and discussion, the opaque projector can enlarge small drawings and pictures which can be traced for other uses. In the latest design of opaque projectors the size has been reduced and they have become more convenient and less awkward. Complete darkness in the room is required for them to function properly.

#### RECORDERS AND RECORDINGS:

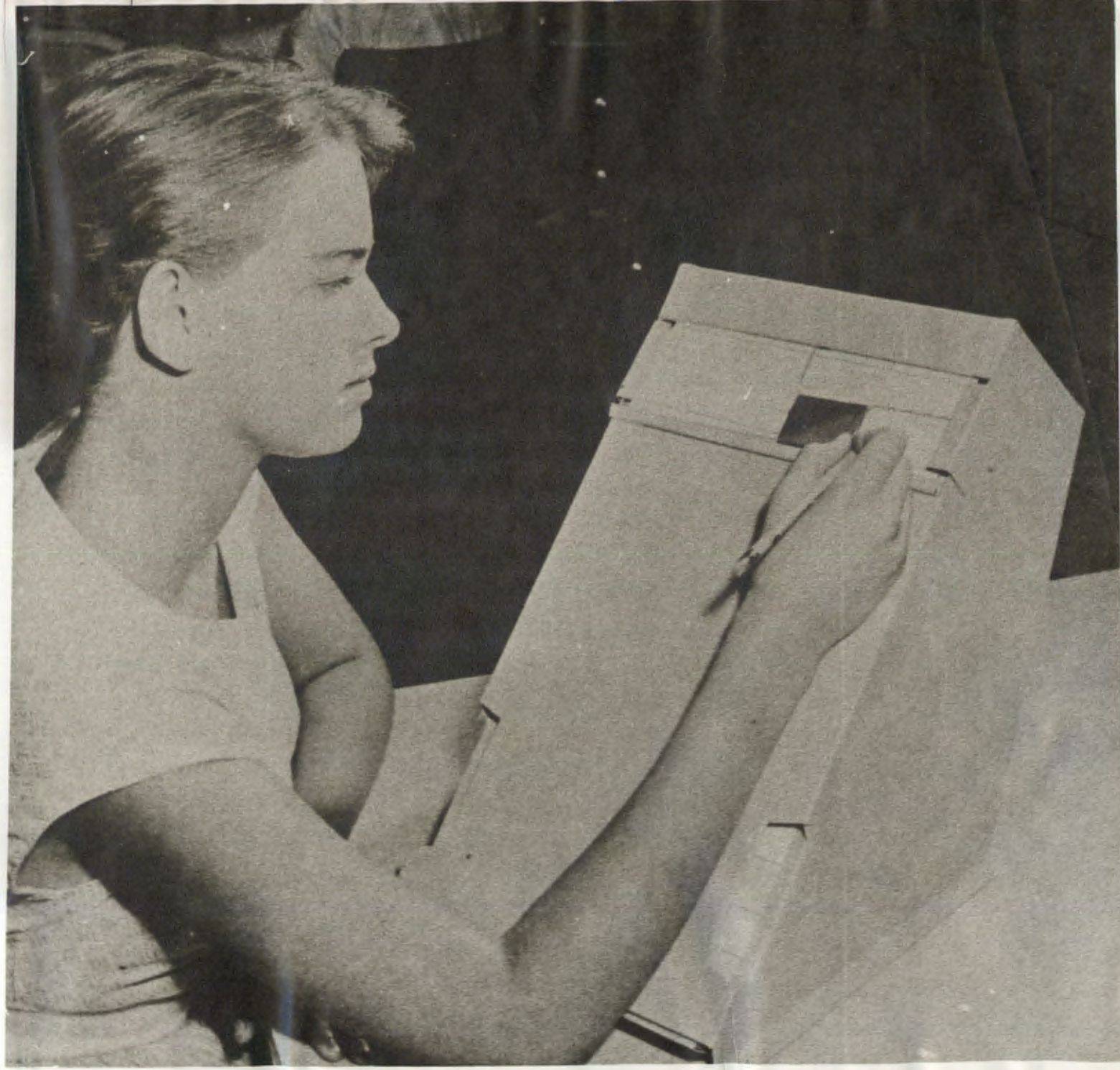
Small, compact tape recorders permit the recording of voice and other sounds from many sources onto magnetic tape for repeated playback. Besides being an integral

part of electronic laboratory equipment, recorders may serve as aids when preparing reports, conducting interview, keeping records, self-evaluating presentations, and listening to dramatic and informative programmes.

SLIDE PROJECTORS AND TAPE RECORDER COMBINATIONS:  
Filmstrips or 35-millimeter slides can be combined with tape recordings, and the two used concurrently. Electronic signaling devices permit automatic changes of slides or filmstrip frames in synchronisation with a recording. This equipment permits student prepared projects as well as carefully designed teacher-made materials to be presented satisfactorily to groups of all sizes, and for as many further showings as are necessary.

SELF-INSTRUCTION AIDS:

A recent development in the field of new educational media which involves carefully written or programmed materials for individual student study is the "teaching machine" or "programmed learning" device.



Such a device, when used in any of its possible forms, presents small increments of information and requires active participation by a student in the learning process through overt responses. Immediately after a response the student finds out whether he was right or wrong. Programmes may be of a variety of types, presented as printed materials in conventional book or work form, on film, or by means of various electromechanical devices.

Programmed materials are best developed for informational and skill-type subjects. Their value lies in the responsibility that is placed upon the student for learning phases of a subject or a skill by himself, at his own rate, without necessary teacher supervision. A great deal of time goes into the design and preparation of programmes in which careful, small-step sequencing will draw out learning responses with little or no error. Each response is built on the ones before until an entire concept to be learned has been presented and responded to in detail, with reinforcement to the point of retention.

#### TELEVISION:

Television has certain qualities remarkably adaptable to educational purposes;

- 1; Television can transmit both sounds and pictures - three-dimensional and two-dimensional, still or moving. The television teacher can make use of all audio-visual materials and can employ a variety of activities - all without losing the one-to-one relationship with the individual student.
2. Television can be viewed by an unlimited number of students in an unlimited number of classrooms.
3. With the use of kinescopes or video tape-recordings, carefully prepared presentations may be repeated at the most effective times. This permits outstanding programmes and outstanding personalities to be fully utilised.
4. Television has a tremendous range of possible uses. It may be a simple magnification device within the classroom, it may provide the teacher

t.v.

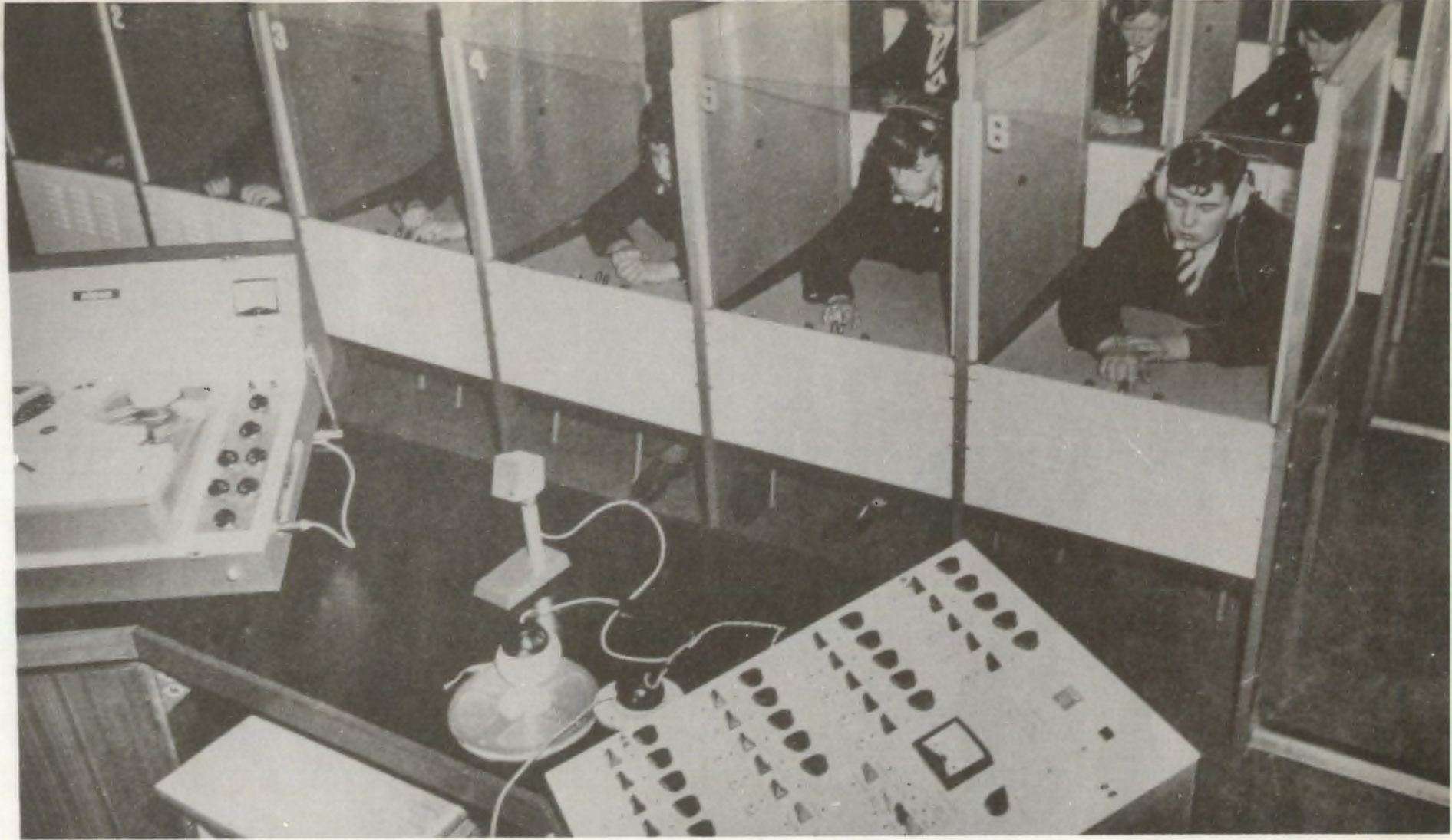


with supplementary materials, or it may form the basis for an entire course.

#### LANGUAGE LABORATORY:

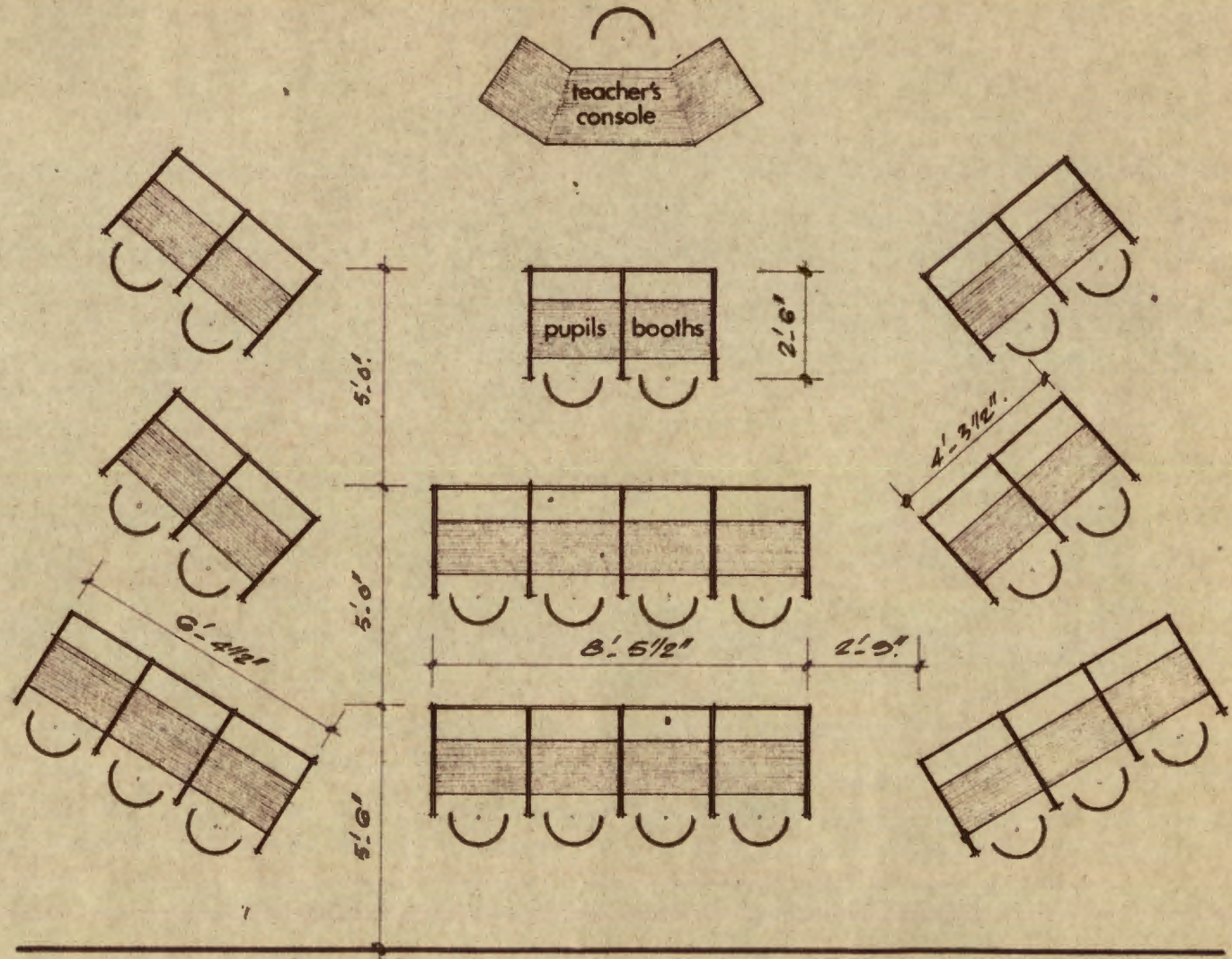
A language laboratory is defined as a "work room equipped with recording and reproduction systems designed to enable a student to listen to native speakers of a language, to imitate what he hears and perhaps record his mimicry, and to compare the native speaker with his own imitation."

A language laboratory consists of a number of sound absorbent booths which separate students from each other and reduce the effect of external distractions. Each student is provided with earphones and a microphone, and has under his control electronic equipment which may consist of an amplifier and a tape recorder, standing on - or sunk flush into- the desk top. The booths are cable-connected to the teacher's control desk, which is preferably placed at the back of the work room, where the teacher can still observe students effectively but is out of their line of sight.



**language laboratory**

LANGUAGE LABORATORY  
simple layout: 24 booths



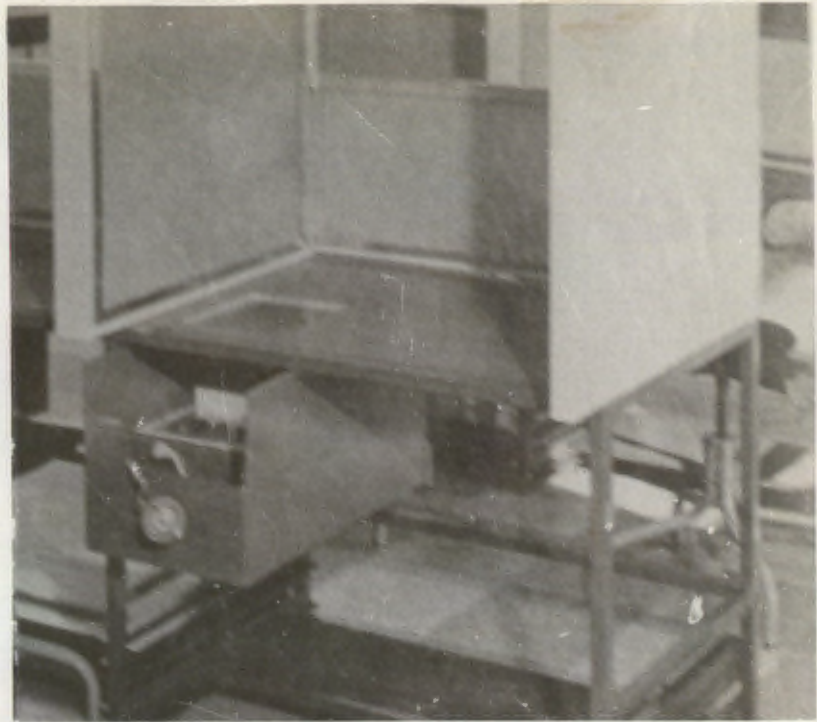
There are three types of language laboratories; the audio-active system; the response-active system; and the dynamic performance system which is still under development.

The audio-active system:

It consists of booths installed in a classroom. The students are only provided with earphones and microphones with associated amplifiers and controls, and are interlinked with the teacher's control desk, which consists of a student selector switching complex and two tape recorders.

This system is used to give beginners confidence, and since only the teacher hears the student's first faltering attempts to be a linguist, embarrassment is eliminated.

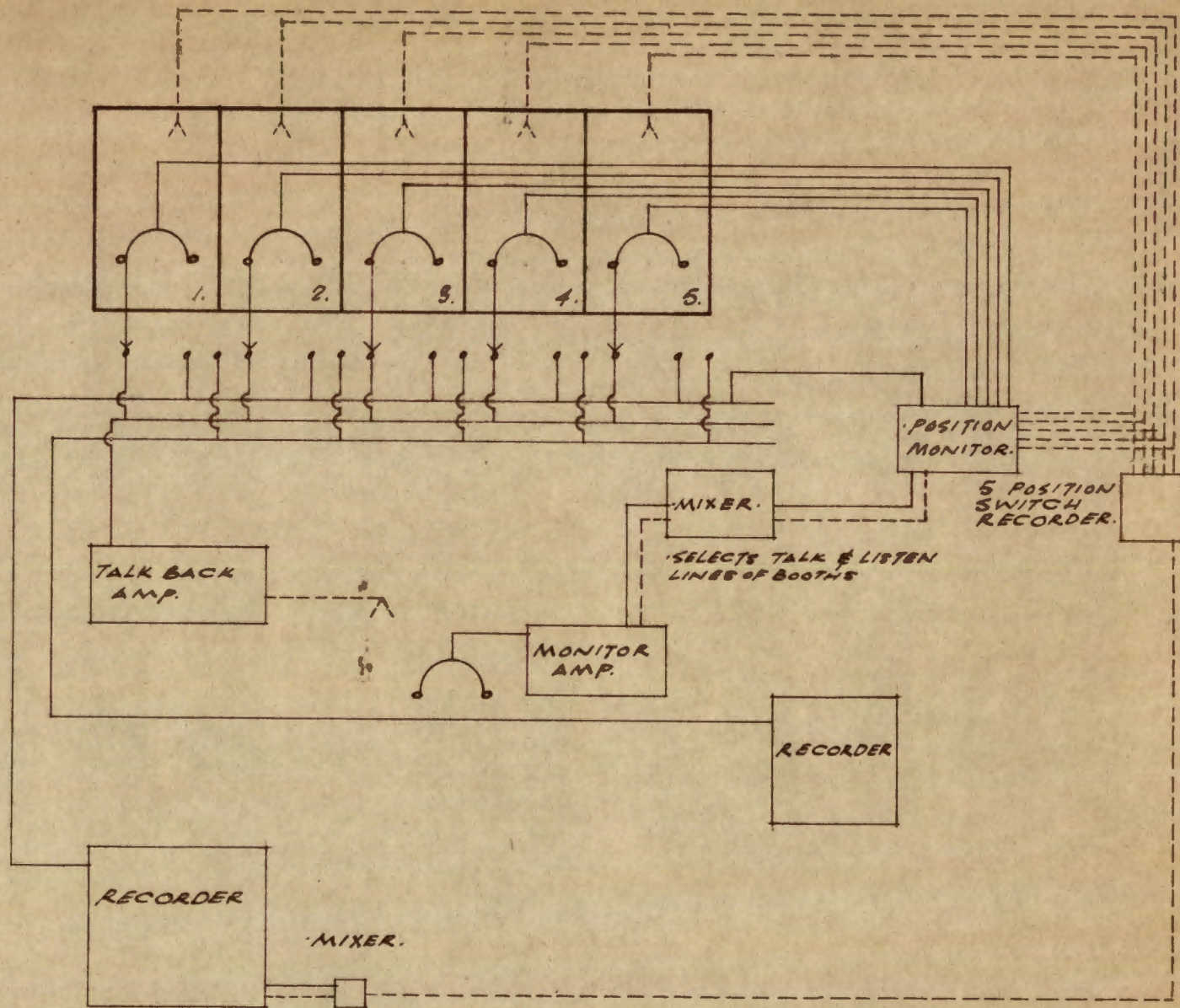
The students listen to a master recording relayed from one of the two tape recorders on the teacher's desk. After each word, phrase or sentence, the speaker leaves an interval for the students to



imitate what has been said. The teacher can listen in to the individual student's attempted imitation and record his faults at a later stage or give the student advice, while the rest of the class continues. Since it is impossible for the student to know whether the teacher is monitoring his responses he cannot sit idle and remain unobserved for long.

The Response-Active System:

This system is planned for sufficiently advanced students to make it educationally and economically advisable to provide each with a tape recorder. The master tape recording is played at a speed of  $7\frac{1}{2}$  inches per second on the teacher's control desk tape recorder, but is relayed through the inter-connecting cables to each student's tape recorder, where it is recorded at a speed of  $3\frac{3}{4}$  inches per second on the master track before the lesson begins. The tape has two recording tracks - the master (top) track on which the speaker's voice is recorded and the bottom track for the student to record his own imitation, which he can erase at will.



**LANGUAGE LABORATORY**

The teacher has full control of the students' electronic equipment, but usually allows the student to operate individually. This system operates the same as the audio-active system except that the student can always listen to his own imitation and improve on his pronunciation by erasing and repeating as many times as he pleases.

The dynamic performance system;

This system has been developed to permit a pupil to learn a language in the same sort of freedom as he would enjoy in a school where the language he is learning is native. Visual material is used in conjunction with sound material. The teacher at the rear of the classroom, operates by push button, remote control slides, 8 mm. or 16 mm. film strip projectors mounted in a sound-proofed compartment on the wall behind the control desk.

In the traditional classroom, the average exercise speaking time for each pupil is only a few seconds per lesson period, and the student feels embarrassed



**teaching machines**

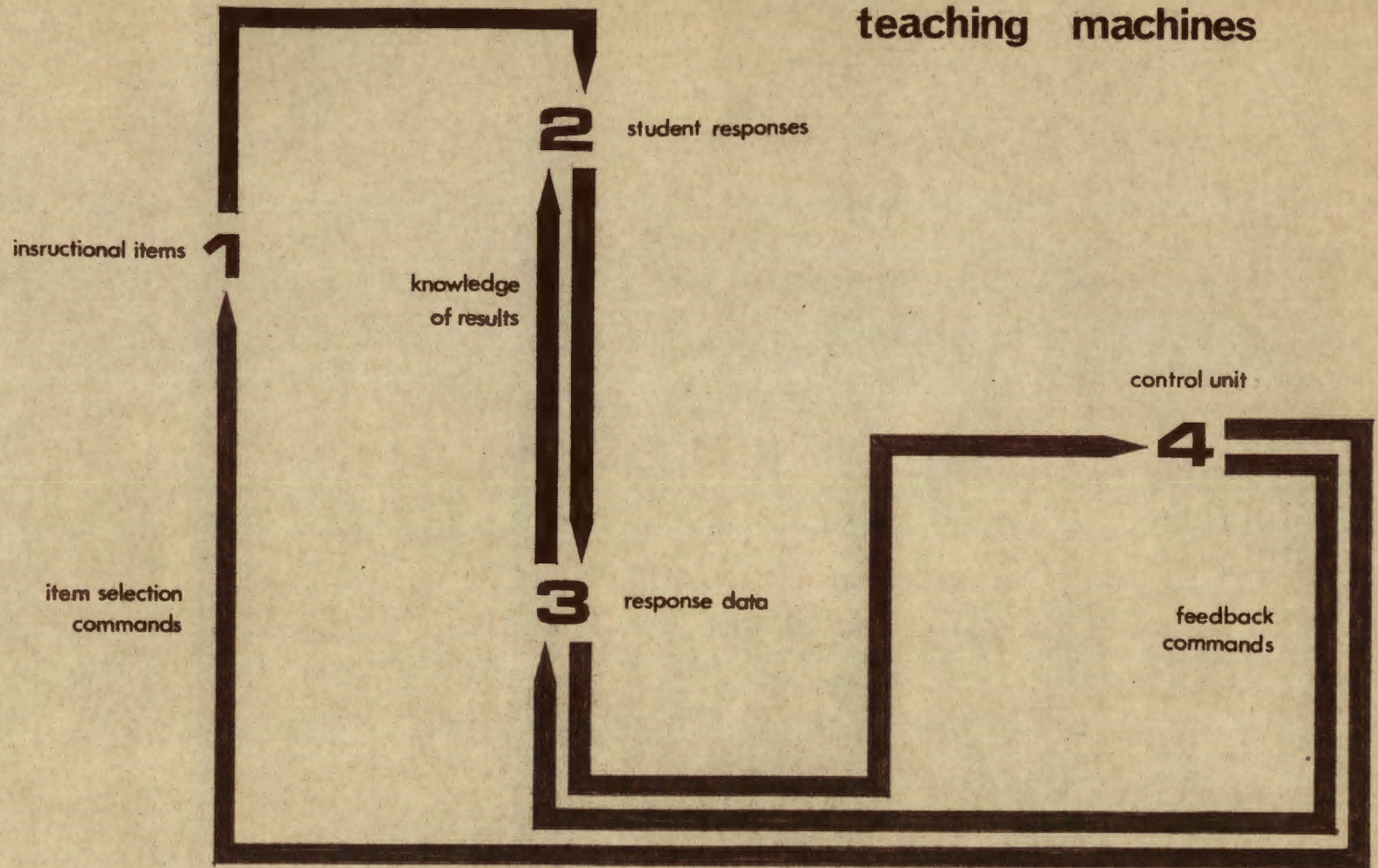
attempting a foreign language while his fellow students look on, fidget or mock him.

#### TEACHING MACHINES:

A teaching machine would more accurately be defined as a "self-instructional device." Included in this category of programmed learning systems are, for example, books with a particular sequence of pages each with a special type of layout; manually operated; box-like arrangements capable of presenting teaching materials in a special sequence and form; television-like boxes containing a film strip projector and entirely operated by push buttons; programme presentation mechanisms associated with ancillary audio-visual aids and capable of simulating a set of circumstances which the student has to resolve by making the correct response; or devices in which the end product may be either work improvement, learning or a combination of both. The student must be able to:

1. Progress at his own speed without being held

# teaching machines







back by his slowest classmates.

2. Work with the full knowledge that his ability will merit its own rewards, without the favouritism of which even some human teachers are guilty.
3. Make up for unavoidable absence, such as illness.
4. Be certain he will have as good opportunities as other classmates.
5. Have access to learning facilities at any time. A teaching machine never tires and is available 24 hours out of 24.
6. Benefit from the very latest teaching materials. Textbooks on science are often outdated in three years or so.
7. Obtain the maximum help in memorising general knowledge items.

Programmed learning is still in its first stages of development, and the results obtained so far have been most encouraging, but until the unreasonably high cost of equipment can be reduced by standardisation and good design, it will be most difficult for our schools to adopt this new educational philosophy.

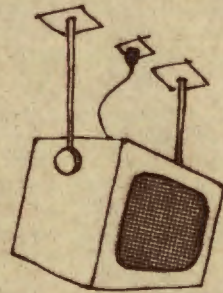
#### INSTRUCTIONAL TELEVISION:

Instructional Television is usually thought of in terms of a fully equipped studio, a television teacher, and students in many scattered classrooms viewing the telecast. The "single room" television system, where the teacher, T.V. camera, receivers and students are all in the same classroom, laboratory, or lecture theatre, is not only a less expensive system, but more practical and useful. Its effects on education has been most successful, especially as far as improving teaching efficiency. It is in this particular context that single room television has its most dynamic effect. In many classrooms and laboratories, teachers are forced to repeat demonstrations and presentations so that each pupil may see, thereby omitting valuable material to avoid time and effort. By simply eliminating the need for duplicate presentations, television is able to reduce the time needed for certain lessons by as much as 70 per cent.

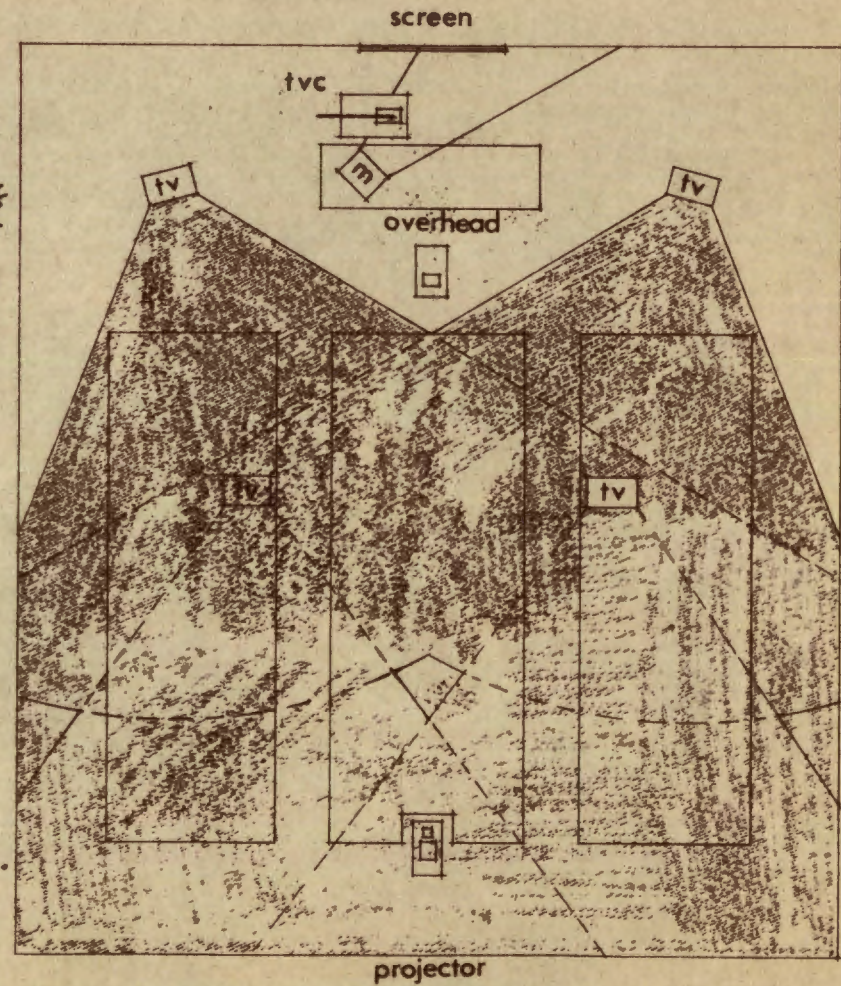
The equipment is easy to operate, dependable, mobile,

## television

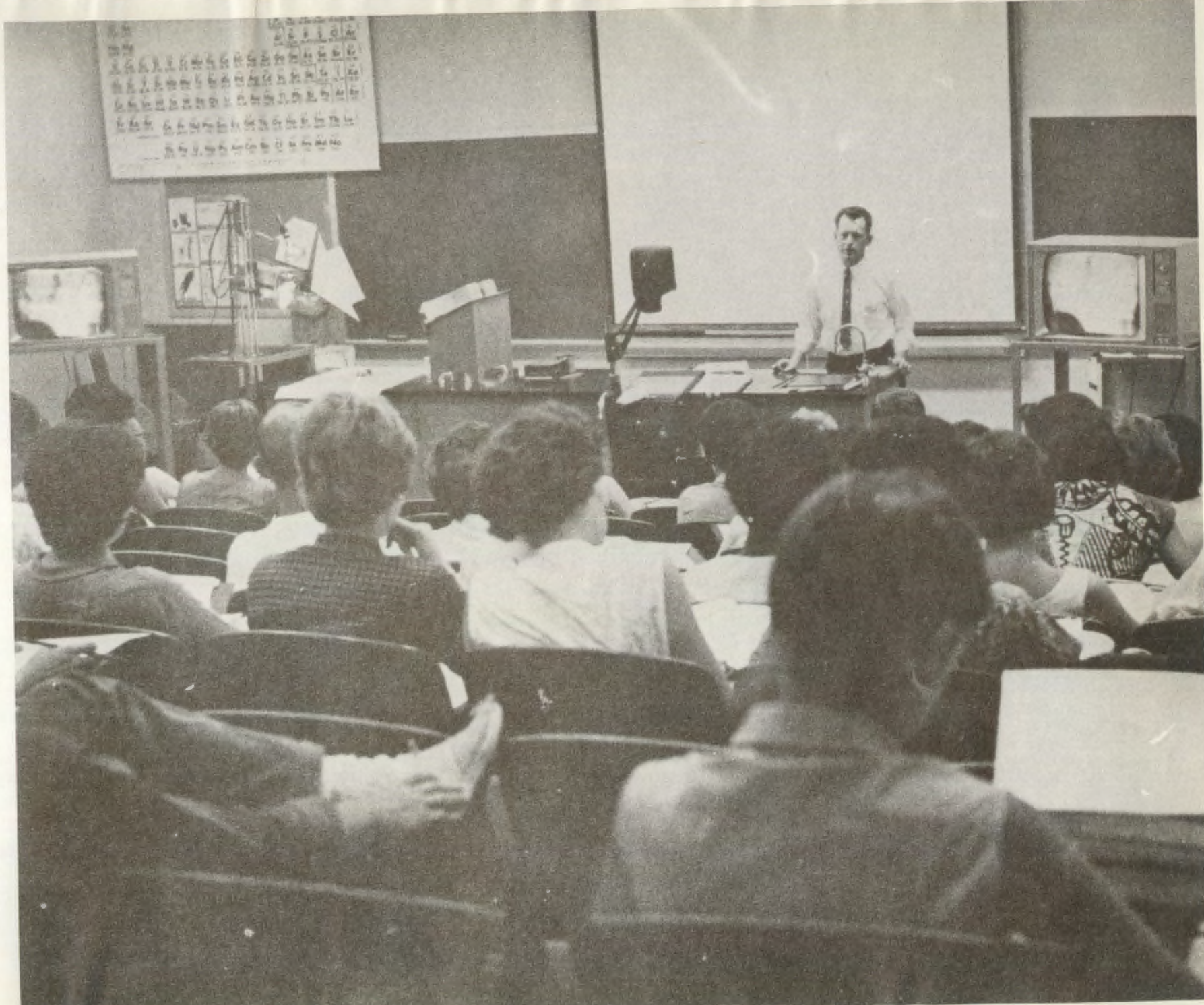
2 SETS, ONE ON EITHER SIDE OF  
DEMONSTRATION BENCH.  
2 SETS SUSPENDED FROM CEILING  
MOUNTS.  
THE CAMERA IS CONNECTED TO  
ONE 17" MONITOR FOR INSTRUCTOR'S  
USE AND TO TWO 23" RECEIVERS  
FOR THE CLASS.  
THIS LAYOUT CAN SERVE  
BETWEEN 100-200 STUDENTS.



• CEILING RECEIVER.



**t.v.**



and unlimited in its application: of all audio-visual techniques, television is the only method that will with any success enlarge three-dimensional objects. Television cameras can magnify and transmit pages of books, small photographs, microscope slides, and by the simple process of adding a light box, transparencies of the type used with an overhead projector.

#### Television in large-group Science Instruction

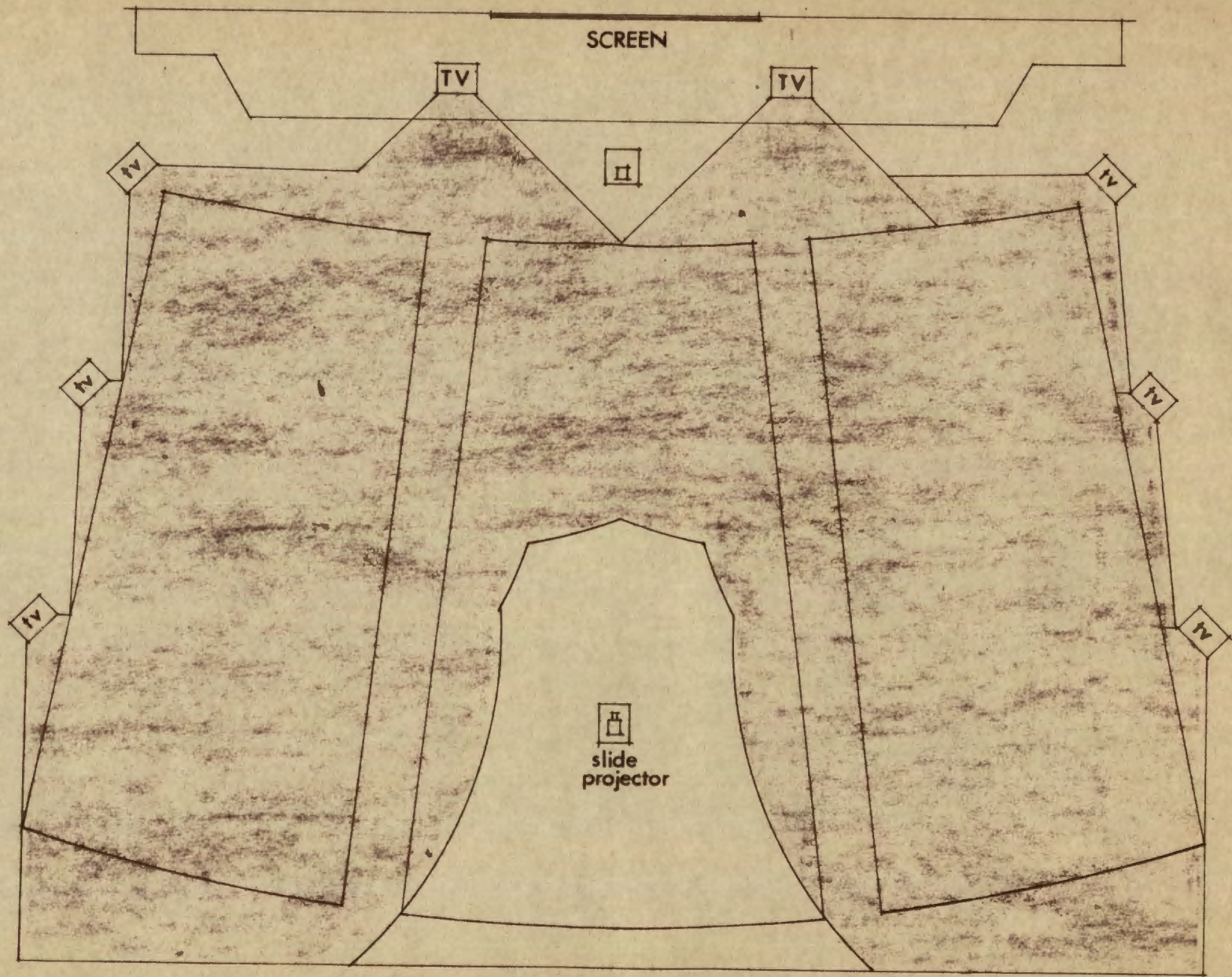
In the field of science, where the number of skilled teachers is limited, the time needed to prepare a particular presentation is often extensive, and the materials required are often in limited supply. The teaching of science is largely dependant on visualisation. When using the conventional magnification techniques, for instance 35 mm. slide projection, it is necessary to turn off the lights. This is a handicap both to the instructor and the pupil, for whom note-taking becomes extremely difficult.

## Use of Television

### Large Lecture Theatre

The television unit is located next to the instructor in the front of the room. The camera is mounted on a rolling overhead stand which allows for vertical and horizontal adjustment. Two movable lamp brackets with two 150-watt flood lights are connected to the vertical shaft of the stand and usually give more than adequate light. The camera is connected directly to one 17-inch monitor for the instructor's use and to four standard 23-inch receivers for the class. These can, when properly located, adequately serve between 100 and 200 pupils. There is one on each side of the demonstration table in the front of the lecture theatre, while the other two are suspended from the ceiling mounts approximately one-third of the way back in the room.

Among the advantages of the television medium for large-class instruction are its great flexibility of use and the fact that it can and should be used with full room illumination. With simple modifications



the basic camera setup can be switched from wide-field magnification to very close up. With high magnification each student can get an almost first-hand view of the specimen instead of being content with squinting halfway across the room at a shiny plaster model.

Television can be used in conjunction with other audio-visual equipment.

#### Planning for Closed Circuit Television

##### R.F. Distribution

Radio Frequency systems are used in most educational closed-circuit television installations. All classrooms designated to use television should be interconnected by shielded, coaxial cable or some other appropriately wired system. The cable usually starts at a central point where the signals are inserted into the system at the origination point. The coaxial cable may be run through conduits or ducts.

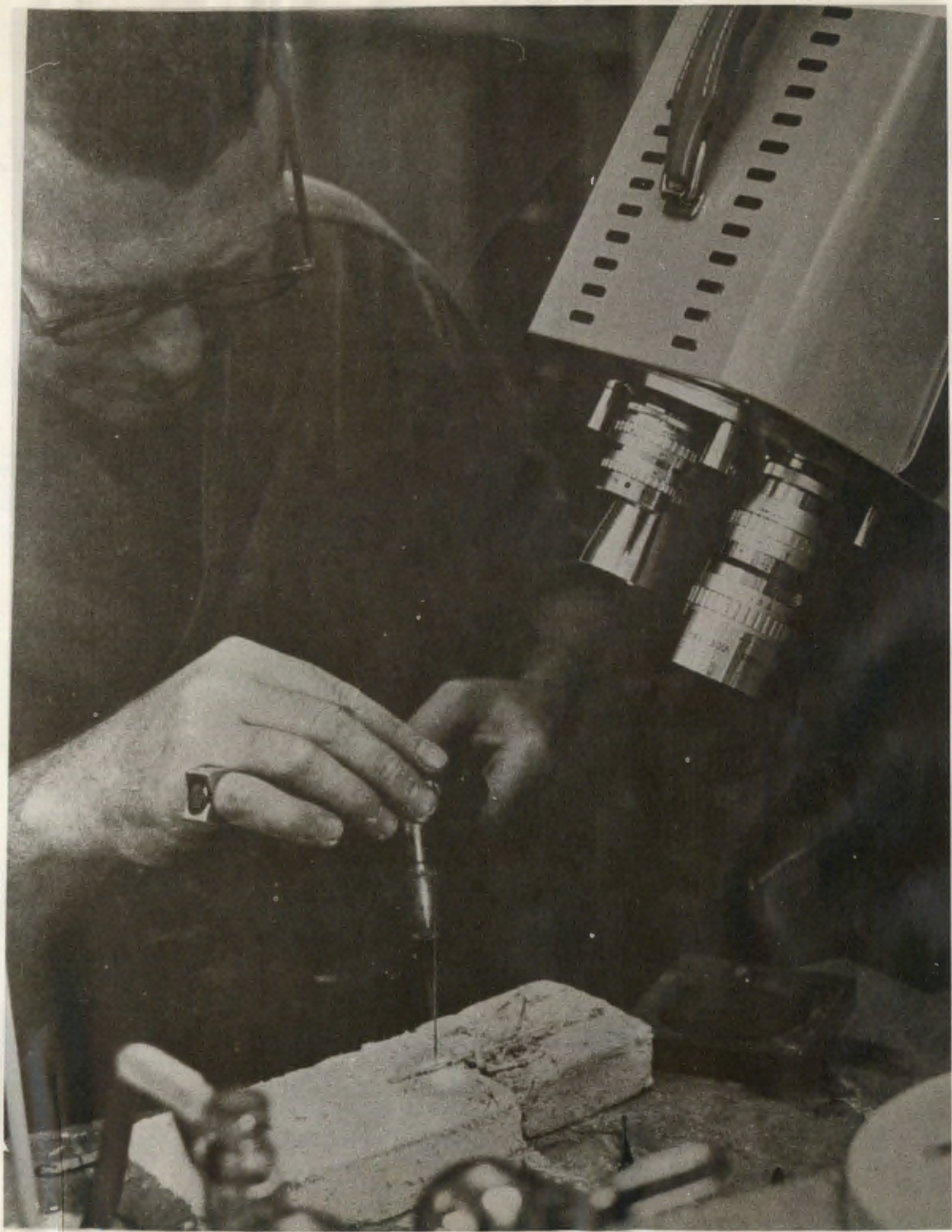
In classrooms, plug-in outlets may be mounted in

boxes placed either inside or on the surface of walls, and "isolation" devices (splitters) may be permanently installed in the boxes. This plug-in allows for the connection of a television receiver to the system and, because of the splitters, any receiver connected to the system may be operated independently and on any channel without affecting any other receiver.

1. Cables:- coaxial type, about  $\frac{1}{2}$  inch in diameter.
2. Conduit:- 2-3 inch in diameter is usually specified.
3. Continuous runs should be arranged to loop through rooms rather than be provided as separate runs to each room.

#### Television Receivers

1. Receivers should be portable if they are to be transported from room to room. They can be mounted on metal rolling stands approximately 46 inches high, with swivel wheels at one end, and fixed, locking wheels at the other end. The top of the receiver screen should be  $4\frac{1}{2}$  to 7 feet above the floor level; it should be slightly tilted, and it should be positioned with their backs toward windows so as to



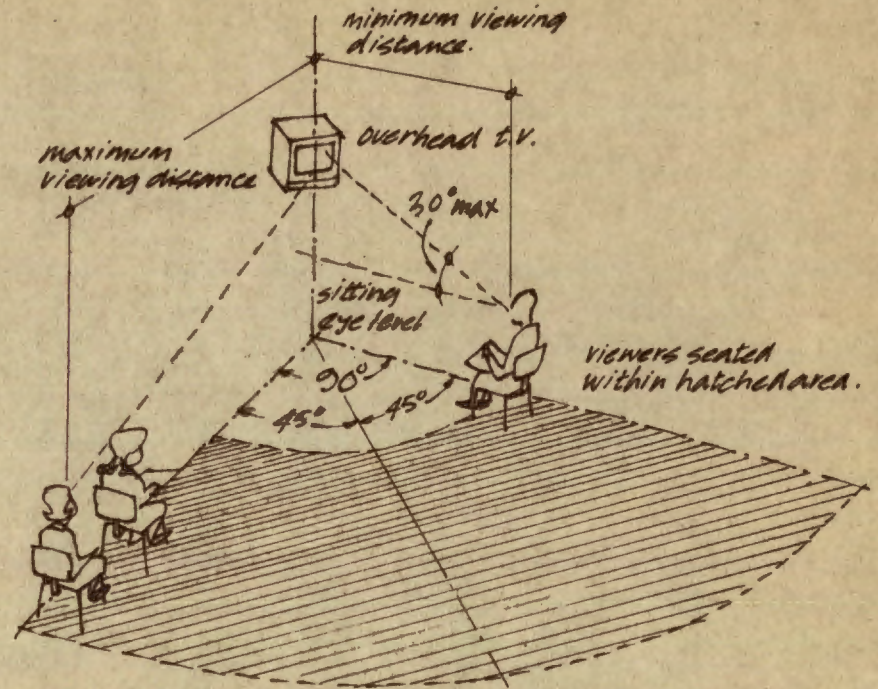
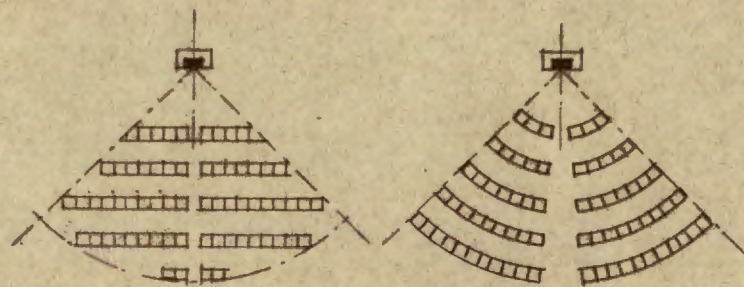
# TELEVISION

SIZE OF AUDIENCE:  
(FACTORS LIMITING THE NUMBER OF STUDENTS WATCHING ONE RECEIVER.)

1. MAXIMUM VIEWING DISTANCE  
12 X WIDTH OF SCREEN.
2. MINIMUM VIEWING DISTANCE.  
VERTICAL ANGLE MUST NOT BE GREATER THAN 30°.
3. HORIZONTAL VIEWING ANGLE  
VIEWERS MUST NOT BE OUTSIDE THE 45° OF THE AXIS OF THE SET.

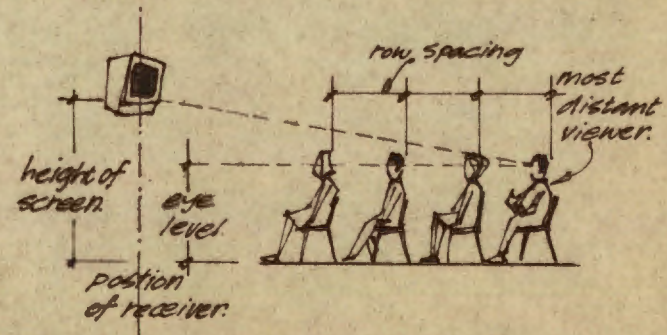
LAYOUT FOR AUDIENCE:

1. THE NUMBER OF STUDENTS ACCOMMODATED WITHIN OR VERY CLOSE TO THIS AREA WILL DEPEND UPON THE SPACING AND ARRANGEMENT OF THE ROWS OF DESKS OR SEATING.
2. ROWS CAN BE STRAIGHT BUT MORE STUDENTS WILL HAVE A COMFORTABLE VIEW IF THEY ARE CURVED.



GROUP TELEVISION VIEWING:

1. Maximum horizontal angle of viewer from screen.
2. maximum viewing distance
3. maximum viewing angle from sitting eye-level to top of screen.



eliminate reflection.

2. The nominal screen size should be a minimum of 21 inches.

3. Speakers should be front-mounted in receivers so that the sound projects towards the viewers.

4. Receivers should have power transformer-type circuits. Without this type of circuit, one side of the chassis can become one side of the power line, thus being a shock hazard.

NUMBER OF STUDENTS	SIZE OF SCREEN
30 - 50	23 inch"
18 - 25	21 inch
15 - 20	19 inch

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