RESEARCH LABORATORIES:

Designing the Unpredictable

by Robert Jensen

BUILDING TYPES STUDY 400
®

Buildings under the vague label "research laboratories" may house anything from comfortable offices for thinking to atomic accelerators one mile long. Thus we called laboratory buildings the "architecture of the unpredictable" in 1965, and it is still a building type which has few defining boundaries; certainly there are no commonly agreed upon architectural forms or materials which, when employed, signify "laboratory."

Designing the unpredictable has become a lucrative architectural business, however. A just-released McGraw-Hill survey of research and development expenditure indicates that, to implement research and development plans, United States manufacturers expect to spend $866 million for laboratories and laboratory equipment in 1969. Approximately two-fifths of this amount will be for laboratory buildings, the remainder for equipment, and the total is 11 per cent more than was spent on such facilities last year. For 1969, American business and manufacturing expect to devote $1.3 billion to basic research, which is 7 per cent of their total investment in the category defined as "research and development." This is a significant increase over the historical trend; it is twice as large as 1967, the latest year for which similar figures are available. The electrical machinery and communications industry will rank this year as the second largest spender for research and development, with $4.6 billion in total expenditures, and it expects to step up its pace by 1972. But it is the aerospace industry which expects to spend more money than any other group. Its $5.6 billion in predicted expenditures represents 32 per cent of all expected research and development in business and industry for 1969.

Clearly, then, architects will be increasingly involved in the design of research facilities; on the following pages we have tried to represent at least partially the diversity of the problems which they will confront. The Science Complex Site Study for Binghamton, New York (pages 136-141) explains a disciplined and innovative design methodology, capable of being applied to one room or to a region, as well as to a science laboratory. The Battelle Northwest Research Laboratories (pages 142-145) are facilities in which ambience and symbolism seem more important design criteria than any physical process; and General Electric's Space Research facilities (pages 146-150) illustrate an approach to the problems which occur when the architect is told nothing about what his building will house.

IMAGERY AND SYMBOL IN RESEARCH:

The laboratory as a place to think

A research laboratory need not accommodate the movement of diverse groups of people, or complex functions and large machinery, or exhaust the gasses of a chemical experiment. It may, like the Battelle Northwest Laboratories on these pages, be principally a place to "think," not "do."

Battelle Institute, a large private and non-profit research foundation, decided to build new facilities in Richland, Washington, after receiving a contract to manage the Federal government's huge atomic energy research plants nearby. Naramore, Bain, Brady and Johanson were hired to master-plan and design the new facilities, the first stage of which is shown here.

The architects were confronted from the beginning with a program which called for a complicated number of individual spaces and rather small laboratory areas. It is a program to house individuals or small project groups who work alone, rather than to house people who work constantly together or require frequent and efficient access to each other. It is, again, a program for thinking rather than doing.

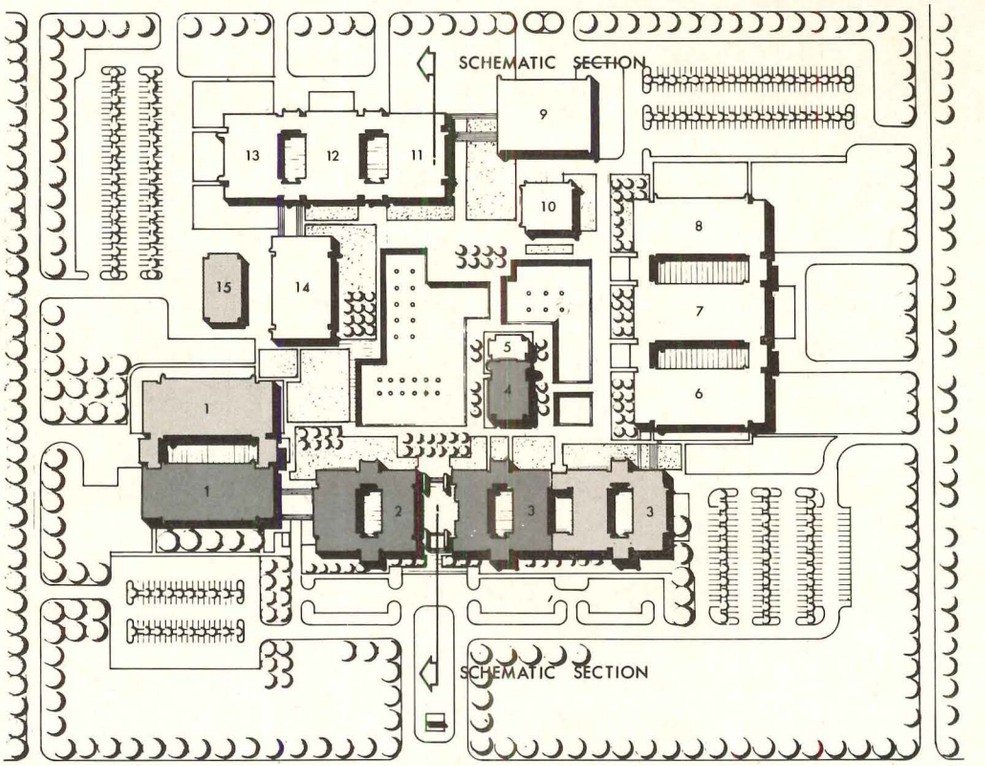
FACTORS AFFECTING DESIGN

As the normal work of the laboratories requires privacy, it was felt from the beginning that the architecture should somehow encourage interdisciplinary discussions and the casual meeting of diverse groups, things which do not necessarily occur during the course of work.

Along with this major internal need, the architects list three significant external effects upon the design:

- The large-scale natural elements of the site; that is, the flat, vast range land on which the buildings are placed, and the rugged mountains in the distance.
- The severe climate: strong sun, little precipitation, extreme temperature variations, and a strong, dust-carrying wind. It is principally a desert ecology.
- The man-made facilities surrounding the site, which were considered a detrimental element in the environment.

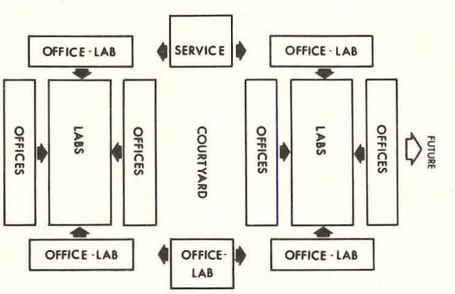
The architects' response to these pressures of the site and the nature of the work performed was to turn the project inward. A rather formal line of trees has been planted completely surrounding the site, along its periphery road, strongly identifying those elements included in the project, and those excluded from it. Their function



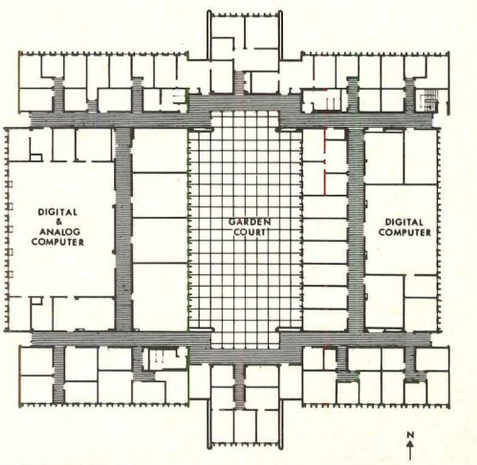
SITE PLAN OF BUILDING COMPLEX

1 Physical Sciences
2 Mathematics
3 Research Operations
4 Auditorium
5 Library
6 Plastics
7 Metallurgy
8 Chemistry
9 Maintenance
10 Cafeteria
11 Pollution Control
12 Food
13 Wood
14 Electronics
15 Engineering

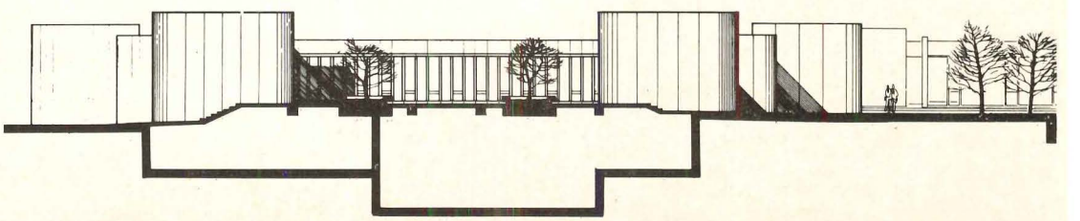
Completed
Under Design or Under Construction
Future

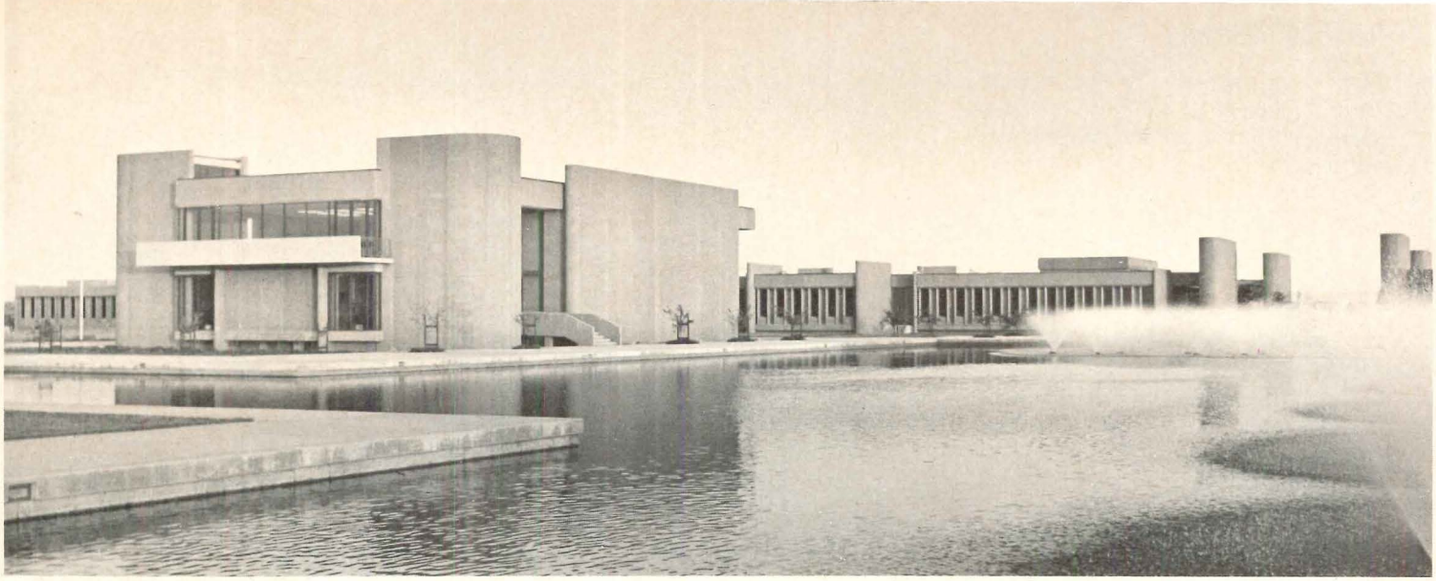


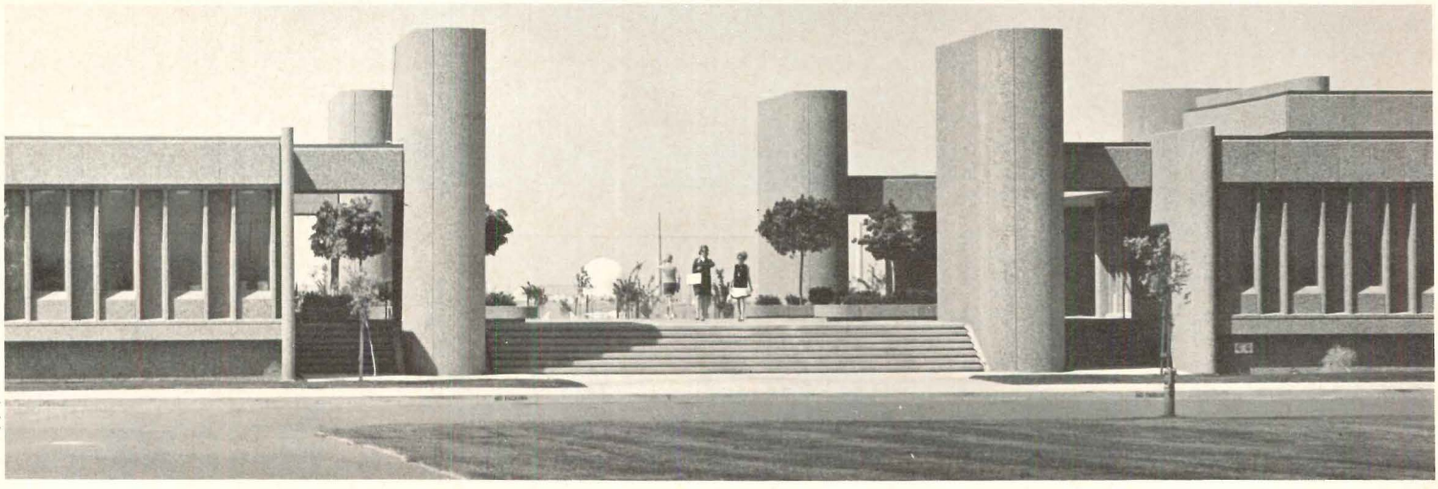
CIRCULATION AND ACCESS DIAGRAM



MATHEMATICS BUILDING







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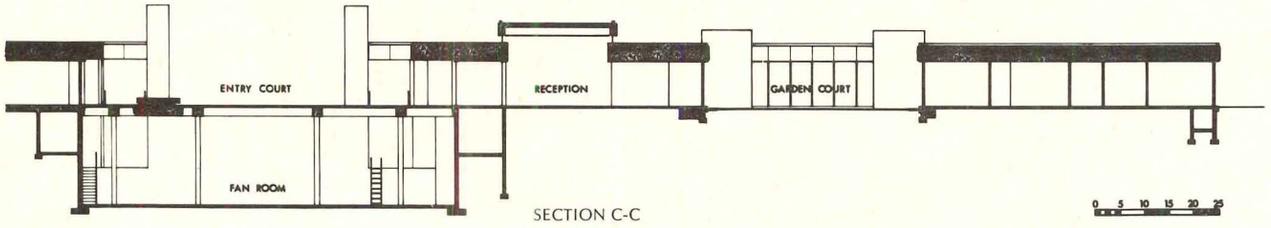
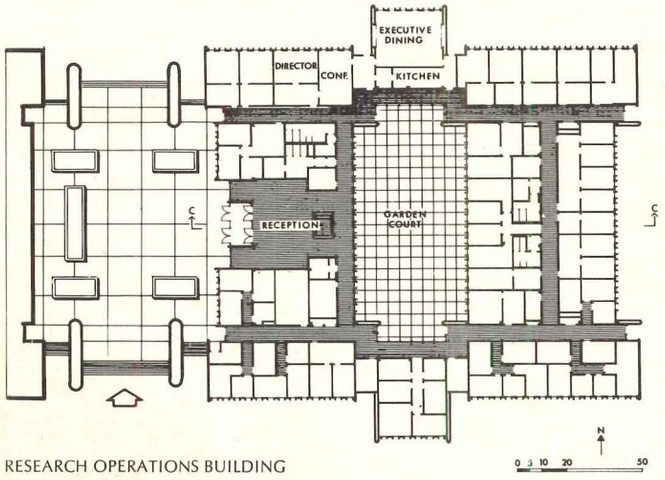
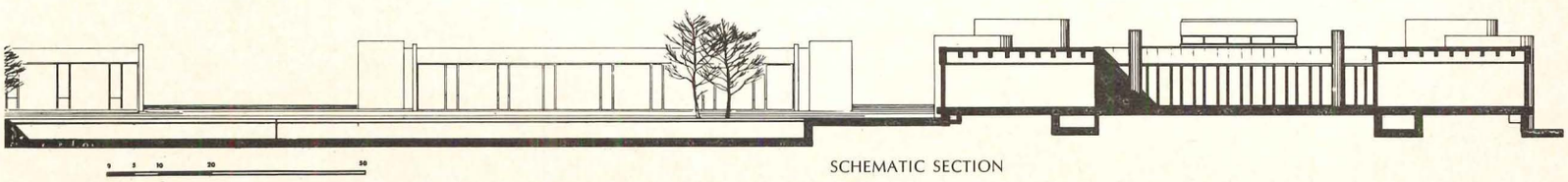


SECTION C-C



RESEARCH OPERATIONS BUILDING

The four buildings now existing accommodate about 400 people, one-half of them the scientists and Ph.D.'s who form the nucleus of the Battelle research capability, and one-half of them technicians, clerical help and administrative staff. The Research Operations Building (left) houses the administration, including a small executive dining room and the public reception area. The Mathematics Building (far left) houses the two large computers on the site, a major support facility for all research. The schematic section (below) is cut through the entire site, showing the shallow pool at the center, and the main mechanical equipment room below the entrance court.



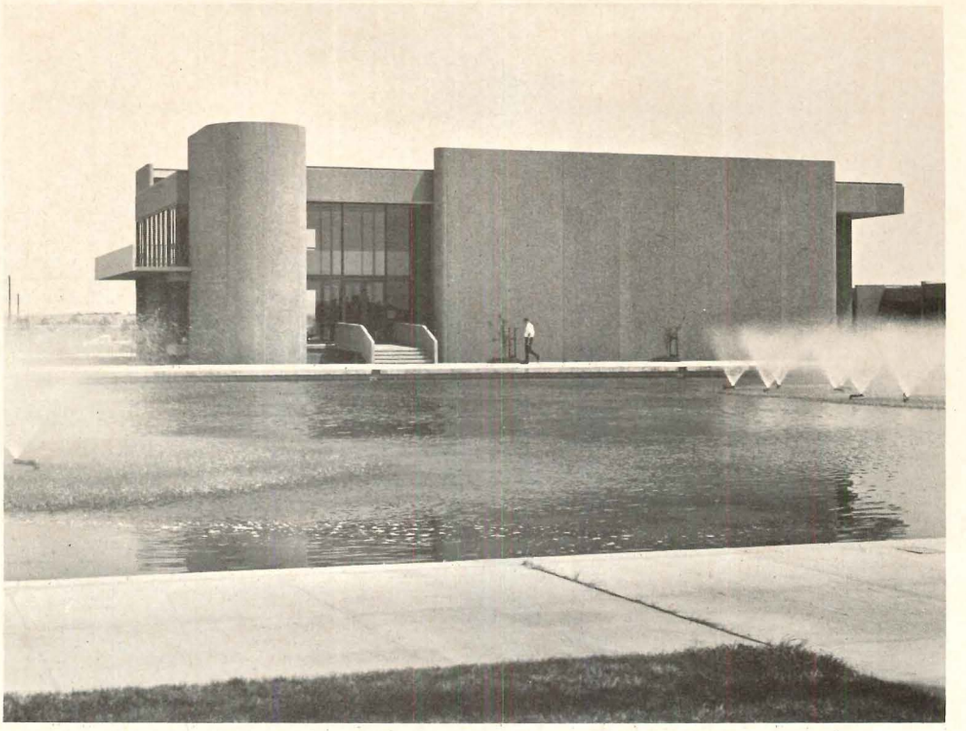
SCHEMATIC SECTION

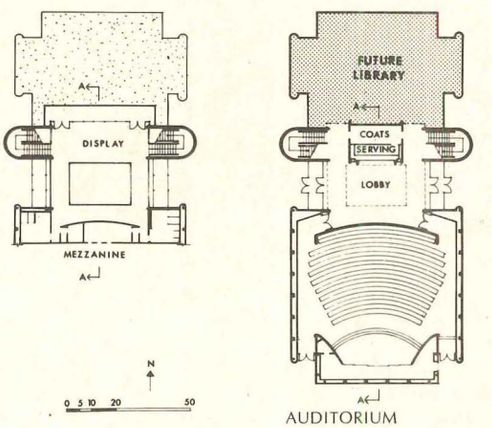
is symbolic now, because the trees are not yet grown, but eventually they will act also as a visual screen and as a windbreak. The ten-year plan for the total campus, and the individual buildings themselves, continue the focus inward. The center of the project is its man-made pool, around which all of the buildings will eventually be placed. Visually, the pool is a surprising, textured, and dynamic feature, with rippling, shallow water and formally arranged sprayers. As a part of the mechanism of the site, the pool performs as the heat sink for the air-conditioning system, with some of the heat diffusing through the spray itself. The individual buildings are further turned inward toward their garden courts, so that the whole is a progression of inward focuses from trees surrounding the site at the largest scale, to the courts of the individual buildings at the smallest.

The campus, as it seems proper to call it, has an oasis-like quality about it; it seems special, slightly austere, a controlled and contemplative world. The buildings, the ground between them, and the pond are raised a full four feet above the surrounding site, so that one must walk up a broad flight of stairs to enter a building or pass between them to the pool. The pool and walk surrounding it have then been lowered two feet to an intermediate level (see schematic section, preceding page). The buildings and walks on the podium form a strong horizontal element, rhythmically strengthened by the vertical panels of the window walls, but interrupted by the vertical pylon forms, which occur as parapet end walls and, at the entry, as announcements and direction-givers to the public. These entrance pylons double as supply and exhaust shafts for the mechanical room below them. The varied exterior forms are held together visually by the use of one exterior material, precast concrete. It carries a strongly textured, pebbled finish throughout, with the aggregate color from a light tan to dark brown.

One of the prime architectural purposes at Battelle, then, has been to aid in the mixing and social exchange between people, and this has been complementary to the physical need for enclosure, caused by the climate and the immediately adjacent environment. The inward focus, its exclusive as opposed to inclusive arrangement, tends to create in its users a sense of belonging together, of being members of a larger unit than their individual projects define or are able to include. In this sense, the values of the architecture, the issues to which the design presents itself, are not technical—solving any complicated functional need—but psychological, in the range of visual imagery and symbol.

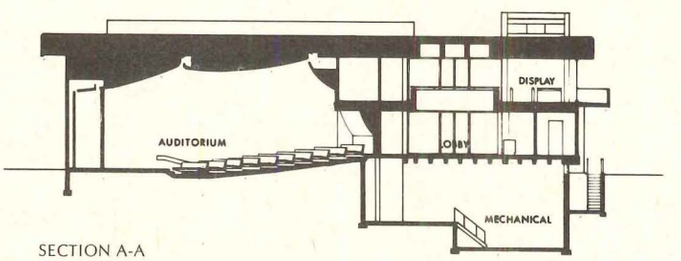
BATTELLE-NORTHWEST TECHNICAL CENTER, Richland, Washington. Architects: *Naramore, Bain, Brady & Johanson—William Bain, Jr., partner-in-charge; Michael Ossewaarde, project architect; James Jonassen, job captain;* structural engineers: *Skilling, Helle, Christiansen, Robertson;* mechanical and electrical engineers: *Bouillon, Christofferson & Schairer.*





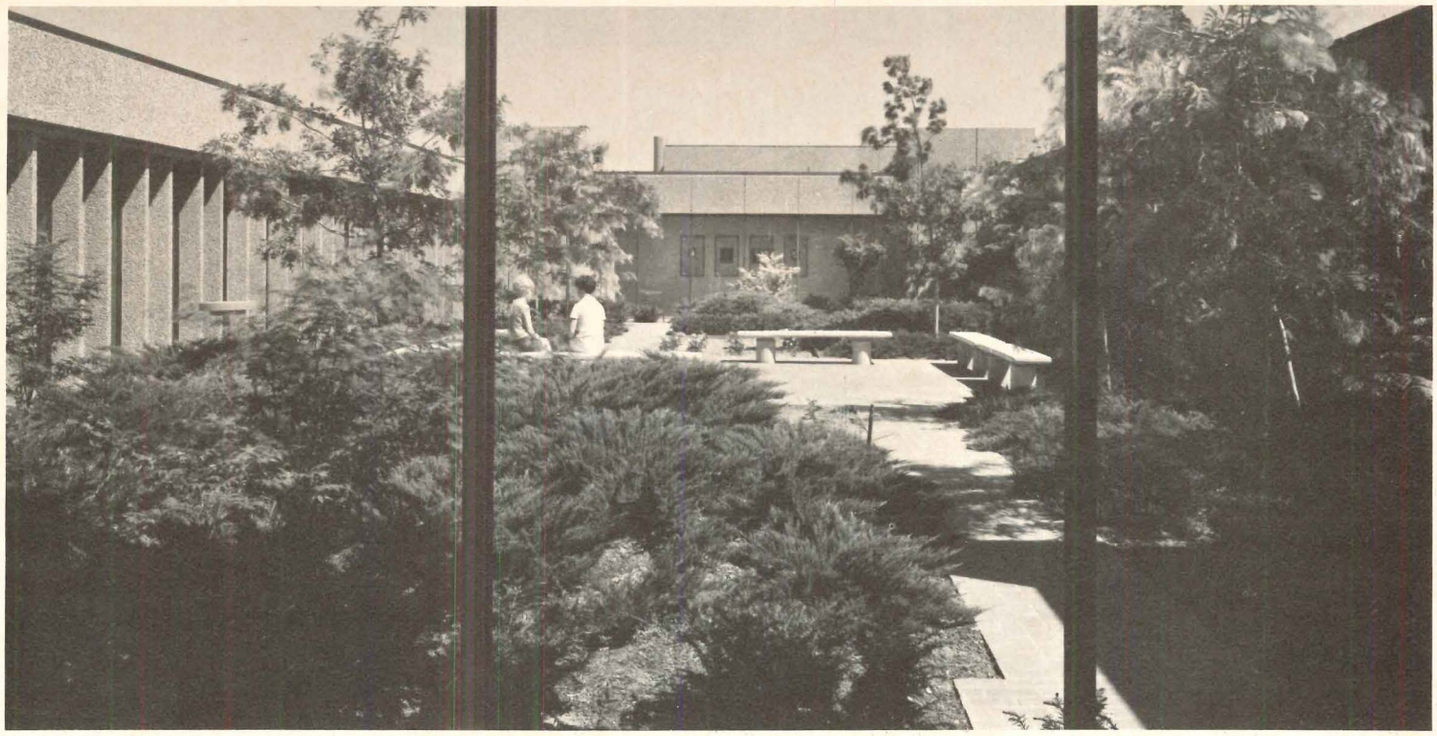
AUDITORIUM

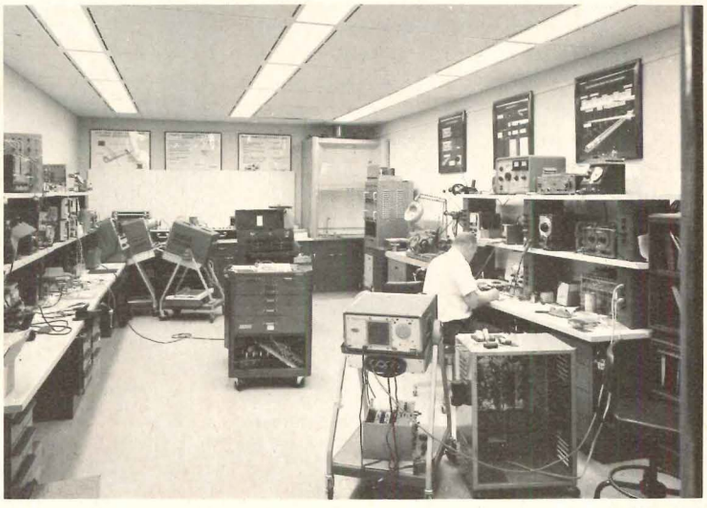
Above is a view of the auditorium and the pool which surrounds it on three sides. At right is the interior of the two-story auditorium lobby, shown also in the section, below. The future library, to be added to the present auditorium, will contain 4,000 square feet of floor space and is scheduled for completion in 1970. Battelle owns a large tract of land surrounding the development site, which is now planted in alfalfa (below). This field will eventually be supplanted by pilot manufacturing facilities.



SECTION A-A

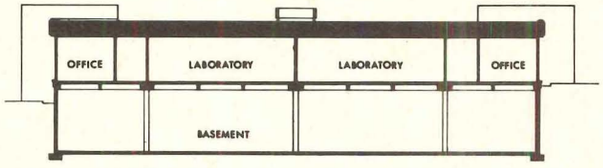
Pacific Northwest Labs.





Pacific Northwest Labs.

The Physical Sciences Building (below) has its offices arranged along the exterior, with its larger laboratory spaces (one of which is shown above) placed on the windowless interior of the building. The partitions within this structure and the Mathematics Building are organized on a grid system, and have proved very flexible as space requirements change. About 95 per cent of the partitions in these two buildings do not extend to the ceiling, making the interiors more spacious in reality than they might seem in plan.



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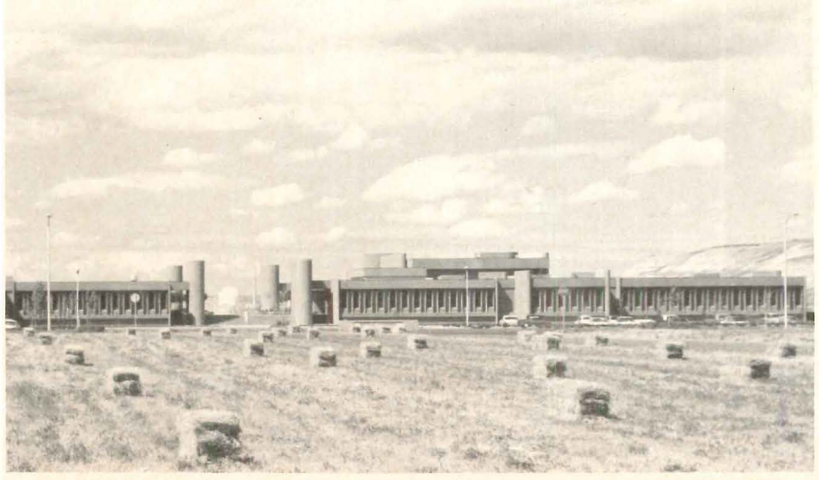

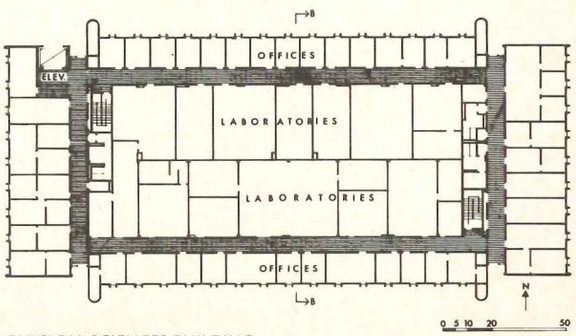

PHYSICAL SCIENCES BUILDING