



**Fig. 1.** Mariella Marr, Lakewood High's paraprofessional—formally, laboratory director—dons her lab coat at the beginning of a busy day.

**L**AKEWOOD HIGH SCHOOL, with 3,600 students in grades 9–12, is located in a middle-class suburb of Cleveland, Ohio. The biology curriculum includes courses in regular and slow-learner (basic) biology, physiology (advanced biology), and horticulture, and biology has a share in an interdisciplinary course in space science. There are 11 teachers and well over 1,000 students in the biology department. All courses except space science include a great deal of laboratory experience: most have two double laboratory periods a week (total length 85 minutes). Laboratory science of high quality would not be possible at Lakewood without the aid of the paraprofessional, whose work is described here.

### *How the Need Arose*

In 1963 biology teachers and administrators at Lakewood studied the then-new BSCS curriculum. It became clear to us that, to effectively implement genuine laboratory biology, two requirements would have to be met: more class time and the help of a laboratory paraprofessional. Subsequently the biology teachers requested seven 40-minute periods, including two double laboratory periods a week, instead of the six 40-minute periods and one double laboratory period provided previously. They also candidly stated that BSCS biology could not be properly taught without a laboratory paraprofessional. The administration was sympathetic to both requests.

# The Paraprofessional In the High School

ARTHUR D. MEYER



**Fig. 2.** Student Terri Clark makes up the blackboard listing of the next day's laboratory and audiovisual needs.

Because there was no precedent for a laboratory paraprofessional in our school system, and thus no job description, the applicant was hired as a teacher's aide. The problem of locating a qualified person was solved by placing an ad in the local paper. It was assumed that in or near Lakewood someone—probably a homemaker—with some background in biology and chemistry would be interested in this kind of service.

The applicant hired, Mariella Marr, had completed one year of nurse's training, had been a laboratory assistant in a medical office, and had worked for a brief time as a laboratory aide in a metallurgic laboratory. Fairly recently, she had taken courses in biology and chemistry; and she in-



**Fig. 3.** Student John Rainieri loads the dishwasher. Note the well-organized shelves of reagents and other chemicals. Student assistance is a big part of the Lakewood High program.

icated a desire to take more courses in educational psychology. (This she did, in the Kent State University extension program, after she was hired.) Mrs. Marr desired to return to work, at age 35, to help defray the college expenses of her four children. She was interested in the Lakewood paraprofessional position because she lived in the school district and had children in school. (Their vacations would,



**Fig. 4.** Student Jean Brown waters plants in the greenhouse, which is located just down the hall from the preparation room.

therefore, coincide with hers.) From the happy experience of the past 10 years, it seems the job could not have been filled by a more capable and qualified person.

Several years ago the biology department chairman and Mrs. Marr wrote a description of the paraprofessional's essential skills, responsibilities, and duties (accompanying table).

### *Efficiency and Enthusiasm*

Our paraprofessional has carried out her duties and responsibilities efficiently and with great enthusiasm. At the beginning of each school year she prepares a "who's where" chart of classroom teacher locations for each period of the week. She assembles lists of the number of students in each class and prepares sign-up sheets for laboratory-exercise materials and visual aids. Once a week every teacher in the department meets with her to discuss material needs for the next week; preparations may thus be begun and duplications avoided. Visual aids are signed for at this time also. At the start of each day these lab and visual-aid sign-ups are recorded on the chalkboard, so that student assistants know where and to



**Fig. 5.** Mrs. Marr keeps a wary eye on the gauge of the autoclave. Lab safety is her constant concern.

whom to deliver materials (by means of a cart) on schedule.

Our department is fortunate in having a full-sized classroom, specifically remodeled for preparation purposes, available to the paraprofessional. In the room are long tables, shelves, cabinets, two sinks, an autoclave, a stove, a refrigerator-freezer, a still, a microtome, and other equipment. Our paraprofes-

**Job description, biology laboratory director, Lakewood High School (slightly edited).**

#### RATIONALE

The program of the biology department is laboratory-centered, and it aims to provide a maximum of individual inquiry. The preparation laboratory is expected to provide a great variety of materials and equipment in the proper amounts and at specific times.

The primary aim of the preparation laboratory is to free the teachers for the more productive duties of lesson preparation and teaching.

#### EDUCATION AND SKILLS. The laboratory director—

Should have had general college courses in biology and chemistry.

Should have work experience in a medical or commercial (industrial) laboratory.

Must be skilled in—

1. Accurate weighing with balances.
2. Accurate preparation of chemical solutions.
3. Safe operation of centrifuge, autoclave, and other laboratory devices.

Must also have—

1. Thorough knowledge of safety precautions in the use of potentially dangerous chemicals, equipment, and microorganisms.
2. Competence in sterile techniques.
3. Familiarity with the metric system of measurements.
4. Ability to develop, test, and standardize procedures and to prepare organized records needed for future use.
5. Ability to supervise and instruct student assistants.

#### RESPONSIBILITIES

The efficient operation and functioning of the preparation laboratory.

To supply the laboratory needs for use in five courses: BSCS biology, slow-learner biology, horticulture, physiology (advanced biology), and our section of the space-science course.

To organize the materials for the maximum learning situation with the most effective use of our equipment.

To provide for the development and testing of new exercises.

#### REGULAR DUTIES

Prepare, assemble, schedule, and deliver equipment and materials needed for all laboratory sessions.

Clean and store equipment and materials after use.

Train and supervise the student-assistant staff of approximately 15 helpers.

Culture and maintain colonies of organisms, such as protozoans, algae, fruit flies, mice, and bacteria. Some of these are made available for use in the elementary science program.

Prepare chemical solutions.

Purchase supplies for immediate use (local).

Supervise approximately 125 physiology "mousekeepers" (students), who will perform nutritional studies involving daily care and special diets over a period of eight weeks.

Supervise make-up tests for teachers, when requested.

Operate the autoclave sterilizer.

Maintain an inventory of supplies and other materials, such as glassware, chemicals, and various other expendables.

Assist teachers with the scheduling of exercises.

Investigate and pretest new labs and new procedures and techniques, to determine suitability and to suggest improvements.

Attend departmental meetings, when requested.

#### EXEMPTED DUTIES

*The following are departmental duties from which the laboratory director is specifically exempted:*

Typing, mimeographing, or duplication of tests, laboratory directions, and other forms for teacher use.

Taking over a class for a teacher, or acting as a substitute.

Supervision of make-up laboratory exercises involving chemicals, equipment set-up, and potential dangers.

Field collection of plants and animals.

Disciplinary detention.

Correcting tests, reports, and other papers.

Assigning grades.

Operating the movie projectors in classrooms.

Room clean-up after laboratory sessions. The preliminary clean-up and return of materials to the cart is the responsibility of the teacher.

sional has fully organized all the items in this room and has lists of items in other rooms. Microscopes and certain basic materials, of course, are located in each biology laboratory-classroom; but the center of all of our laboratory work is the preparation room.

Toward the end of the school year, when student scheduling for the next year is being done, the laboratory paraprofessional selects her student staff



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for the next school year from among those who have applied and have been recommended by their biology teachers. The assistants, selected from grades 11 and 12, usually serve for one period a day; many do so for two years. They become exceptionally devoted to their work, because they are guided expertly by the paraprofessional. The "biology student staff" has become one of the most respected groups in the school. They have social activities occasionally, and many of the "alumni" return to visit the department. The positive role of the paraprofessional in promoting student interest and loyalty and in encouraging excellence is observed constantly in the preparation room.

It should be clear from the above that the teachers in our biology department are very pleased with the way our laboratory paraprofessional has assisted them in the improvement of instruction. The students benefit tremendously, and the teachers have

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fewer frustrations. One problem that we face is the need to convince the administration and the school board that our paraprofessional is as indispensable as we believe she is, and to have her job reclassified from teacher's aide—a classification she now far

exceeds. To date, we have had no success in solving this problem.

*Acknowledgment.*—The department chairman when BSCS biology was introduced at Lakewood was Ralph A. Rood (retired 1970). The present group leader is William G. Coleman. Our paraprofessional continues to be Mrs. Morley (Mariella) Marr.

## Auditioning AudioVisuals

By staff members of the Audio-Visual Center  
of Indiana University, unless otherwise noted

**The human heart.** Recording: cassette (\$4.00), tape (\$6.00); 45 min. Narrator, G. E. Caraker; writer, H. E. Ulrich. 1972. Epsom Science Research Publications, Inc., Penfield, N.Y.

"A person who is 10% overweight is in need of treatment." This opening statement is followed by a wealth of information narrated in a delightful British accent. *The Human Heart*, a timely presentation of facts of concern to all ages and occupations, may help to reduce the great number of deaths from heart disease. The recording is divided into 14 segments separated by bands of silence so each part can be studied and discussed when most appropriate. Because an extensive amount of detailed information is presented, most audiences should take the recording a segment at a time. Although the recording can be used separately, it will be part of a package of materials now in preparation; these materials will include color slides, booklets, a glossary, and a bibliography. The materials would be of most value to high-school, college, and adult audiences.

The recording describes the tremendous amount of work of the heart, the pacemakers, the diastole, the systole, and the renal, portal, and lymphatic circulation. It names the valves and vessels as it traces the systemic and pulmonary circulation, then compares the composition of the blood and mentions hemophilia, sickle-cell anemia, the blood groups, and the significance of the Rh factor. It gives impressive statistics on the number of deaths from circulatory disorders and says that two significant causes—smoking and obesity—can be controlled. It describes hardening of the arteries and the causes and cure of varicose veins. We hear the actual sounds of a normal heart and a heart murmur. The sources of cholesterol and the effects of too much cho-

lesterol are given. The embryonic development of the heart is presented, with mention of the functions of the foramen ovale and the ductus arteriosus. The recording concludes with the statement that deaths from heart and circulatory diseases are on the rise; and we must become better informed, so we can help the doctor to help us.

George Vuke

**Earth's biography.** Four filmstrips: color, sound; also script and discussion guide. 1972. Filmstrip House, Inc., New York. \$36.00.

*Reading Rocks* (58 frames) uses the exposed rocks of the Grand Canyon to introduce the interpretation of strata. It presents the principle of superposition, unconformity, the geologic timetable, and the mechanism of fossil formation. *How Our Continent Developed* (49 frames) outlines the basic elements of the plate tectonic theory, vulcanism, glacial action, and other forces that have shaped the North American continent. *How Life Evolved* (57 frames) scans the living organisms characteristic of each geologic period. *Enter: Prehistoric Man* (53 frames) examines the combined efforts of archeologists, anthropologists, and geologists to discover the history of prehistoric man's development through interpretation of fossil remains.

The visuals consist of drawings and charts, with a few interspersed photographs. Each filmstrip covers a broad range of content within the general topic of the title. The content reflects current theories, but the numerous terms and concepts presented in each filmstrip would overwhelm the average student. Teachers may find it useful to use portions of the visuals, with or without the recorded narration, to introduce the subtopics. Also, these mate-

rials could be used as an overview introduction to a larger unit of study to acquaint students with new terminology, or as a final review of the topic. The treatment and narration are appropriate to junior high school.

Jerry M. Keen

**Introduction to holography.** Film: 16 mm, sound, color; 16 min. 1972: Encyclopaedia Britannica Educational Corp., Glenview, Ill. Price not given.

Holography is a photographic process of encoding and decoding a three-dimensional display. This process is usually carried out with a laser beam. A coherent reference and a pre-"garbled" object beam are interlaced and recorded on a photographic emulsion. When illuminated by the reference beam alone, the developed emulsion produces a whole image of the object. Holography has been shown to have value in biologic research, and it shows promise to contribute to biology-teaching. For example, easy access to nondeteriorating specimens that could be viewed in full perspective would surely enhance instruction.

This film provides a fairly good introduction to holography. Excellent graphics are interspersed appropriately. The initial sequence begins with a discussion of waves and interference. Then, the laser is presented, and the recording and retrieval of split-beam holograms are illustrated. The narrator cautions that exposure must be made on a motionless surface. The next sequence shows how standing waves are involved in white-light holograms. The scene that follows attempts to demonstrate that a whole image can be retrieved from only part of a developed emulsion. Later shots more successfully display a two-channel and a circular hologram. A brief segment on holographic microscopy is included. The final sequence exemplifies the increasing number of applications of this new process.

Some of the previewers were impressed by the motivational aspects of this film; others were annoyed by the production gimmicks. Several previewers thought that the film covers too much ground too quickly. However, most indicated that they would use it in their classrooms. This film is recommended for senior-high and college students.

Mark H. Loberg