

AFRICAN ASSIGNMENT

By C. J. Overbeck

An American physics teacher's account of a three-month stay in Ghana, where he was invited last year to aid in planning for future needs of the Physics Department at the University of Ghana.

AS my wife and I were driven the few miles from the Accra airport in Ghana to the University campus, we felt the balmy evening wind from the Atlantic Ocean. We saw the Ghanaians walking with stately posture along the side of the road; the women, with babies bound to their backs, neatly balancing heavy loads on their heads. Some of them smiled broadly at us and waved friendly greetings. We saw the "Mammy Lorries" careening down the highway as though collisions were impossible. The accident rate is very high. Each lorry, with people packed tight as sardines, expressed the individuality of its owner by its strange printed sign ("It Pains You Why", "Fear Woman", "No Time To Die", "Walk Alone No Friends"). We passed the cassava patches near a mud-hut village and entered the campus of the modern University of Ghana just at dusk of the short tropical twilight. The avenue of mahogany trees and palms was a proper setting for the spa-

cious, airy buildings of heavy, white concrete with red tile roofs. Our own home was located nearly in the middle of the campus about three fourths of a mile down this avenue. The old diamond mines of the Accra plains were near the campus. The rich gold fields of this former Gold Coast Colony, now largely commercially replaced by the cocoa groves, lay in the mountainous area to the north, an area inhabited by the Ashanti tribe whose aggressive forays fill many pages of African history. Our later week-end trips into the interior were adequate proof to us that we were in a land of great contrasts.

In a reflective mood, we recall the conflicting responses evoked by the invitation to us to come to this land. There was the thrill and excitement of taking part in an African adventure. There was the desire to share in the educational development of a new country, the first sub-Sahara nation to venture from colonial rule into political independence, with its resulting tensions and growing pains.

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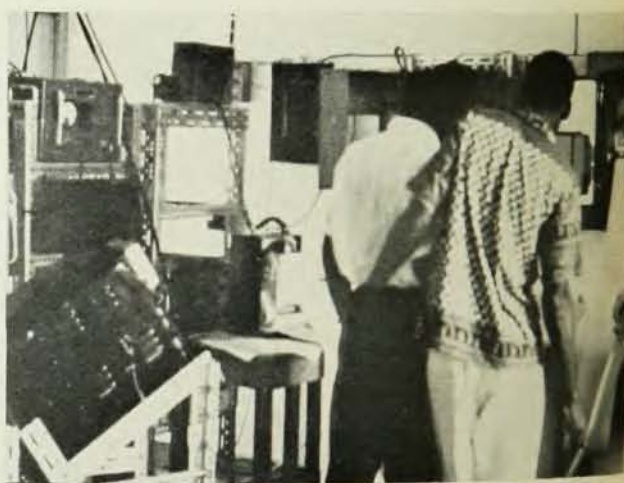
But we knew this also meant living in a land where the conditions, the customs of the people, and the climate were radically different from our own, a land in which many of the comforts we accept as necessities of life were unavailable. We wondered what it would be like to live in this teeming, largely uneducated population as a member of a minority group. The decision to go predominated, and steps were taken to make the needed arrangements. We were subjected to a battery of medical injections and vaccinations. We wrote letters to obtain the needed visas and flight tickets. Somehow everything got worked out in time. We arrived in early January 1962, prepared to spend three months in Ghana—three of the busiest, most interesting months imaginable. The accomplishments were so satisfying that, should a comparable situation be presented again, the decision would be, "Let's go." In late March, when we bid farewell to our many new friends in Africa, we were most appreciative to see our colleagues present at the airport to wish us a safe journey back to the United States.

The main purpose of the trip was to help the Physics Department (eight European professors and lecturers plus a research staff) to make plans to meet the growing educational needs of this new, rapidly developing university. The expectation is that the present student body of approximately a thousand will grow to a figure several times greater within the next few years. Funds for the visiting professorship were provided by the Rockefeller Foundation. The Physics Department decided to use the money to invite someone from the United States to provide a contrasting educational plan for comparison with their present operation. The University, founded in 1948 and affiliated with the University of London until a year ago when it assumed full academic independence, gave the impression of being typically British—almost a transplant of Oxford to African soil. Academic gowns were worn by students and instructors. The student body was divided into compounds (schools), each group of about 200 students having its own chapel, hall, and living quarters.

The fact that the invitation came directly from the University was most helpful. There was no feeling of intrusion of someone assigned to find fault or arbitrarily make changes. The aim was a cooperative attempt to formulate the best plans for their situation. Suggestions of changes, with reasons, were always openly received, and the resulting discussions were invariably a wholesome weighing of relative methods of operation.

The program was actually started many months

prior to my arrival. Correspondence with the Department and one personal contact with a staff member gave me some idea of their probable needs. It was recognized that teaching materials, books and apparatus, were in short supply. To meet this need in part, I suggested to several American scientific apparatus companies and book publishers that they might wish to share in this work by suitable contributions of their products. The interest was most gratifying. Not only did each of them cooperate, but others, not contacted, wrote asking to be included. Several Member Societies of the American Institute of Physics sent copies of their current journals, and the Institute supplied multiple copies of various AIP publications, including current issues of *Physics Today*. One of my first jobs was to distribute this material. Such a plan of procedure may be recommended to anyone contemplating a comparable assignment. I did find a distinct need for teaching supplies for the beginning courses. All of the material supplied proved very helpful in the work. I was pleased to see, however, that the scientific apparatus for departmental research was surprisingly good. The same remarks apply to the other institution of higher learning in Ghana, the Kwame Nkrumah University of Science and Technology located at Kumasi, some one hundred and seventy miles inland.



Some of the apparatus available for research in the Physics Department at the University of Ghana can be seen above. Research is carried out under the direction of staff members of the Department.

First-hand experience with students was essential to the program and I was, therefore, assigned a three-hour per week class. My Ghanaian students proved to be academically well prepared. Ghana

has several very good secondary schools, the outgrowth of mission centers. The students in the class were a chosen few of the country's great number of young people. It was immediately evident, however, that their learning was book learning—book learning from Western texts containing many sections not yet applicable to the experiences or the needs of these students. They knew the answers to text questions, they could solve the problems, but they had never seen many of the devices pictured in their physics text.

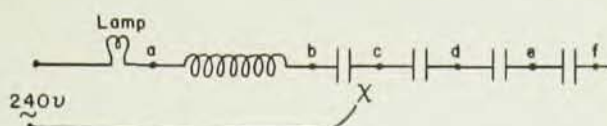
To change this situation, one of my first decisions was to break with past procedure and give demonstration lectures. I have never seen greater student interest. They were not content to "see what happens", they wanted to "see the insides and how it is made". Considerable time was spent in devising simple demonstrations with materials which happened to be available. Preparing a lecture was a far cry from our accustomed instructions to a lecture assistant ("Put out pieces 97, 115, and 201 for tomorrow's lecture"). I am convinced that some of these made-up pieces did a better job of teaching than the shiny, assembled, bought equipment normally used. Lack of money is no justification for avoiding demonstrations. The teacher must only be convinced of the efficiency and effectiveness of this procedure. The preparation time is not too great if care is taken to accumulate the result of each year's effort.

The Physics Department was soon sold on the plan of lecture demonstrations. Carpenters were brought in to build a suitable storage room for apparatus next to the lecture room. Design drawings were started for apparatus to be constructed in their shop. Several days were spent selecting apparatus to be purchased during the next three years. Orders for apparatus and supplies to fit the present year's budget were made out.

The students accepted their responsibilities and recognized that it was a great privilege for them to attend the University. Relatively few students could be accommodated, and these were under family pressure to succeed. There was no need to check on the study of assignments, even though the entire class had to share in reading the few available copies of the American textbook used. They could not afford to purchase their own copies, for the cost was the equivalent of several weeks' work. It was a delight to concentrate in class on a few high points of the assignment, knowing that the rest of the material would be assimilated in outside study.

To demonstrate the phenomenon of electrical resonance, I assembled, for class showing, a lamp,

a coil (primary of an old transformer), and several capacitors as shown in the figure, using the lamp



as an "ammeter". Connecting the lead x to point a gave full lamp brilliancy. Connection to point b barely caused the filament to glow. The "physics" of this phenomenon had been covered in the preceding lesson. Connecting x to point c , to the delight of the students, caused the filament to become bright red. The next step, d , increased the glow, and at e the filament was at nearly full brightness. The students then predicted that the lamp would be very bright on adding another capacitor. Instead, when the terminal was connected to f , the filament again barely glowed. The puzzle was increased when they discovered that the voltmeter readings across some of the elements exceeded the line voltage of 240 volts and gave an algebraic sum across all elements well in excess of 1200 volts. The response of one of the students at this point was quite typical when he said, "Now we've got problems! How are we going to explain that?" They preferred not to be given hints when difficult problems were assigned for solution.

A study was made of the undergraduate laboratories to determine the coverage of the experiments and the correlation of experiments in successive courses. It was not surprising to find some gaps and duplications. The major new changes indicated were not too different from those needed in many laboratories in our country. One of the main needs was an introduction of experiments in recent physics. There was the tendency to stick too closely to a syllabus prepared many years ago.

Ghana needs the benefits of research. Research fights the three most deadly enemies of many of the new emerging nations—namely, ignorance, dietary deficiencies, and disease. The solution of these problems requires not only efforts of application and dissemination of the known, but also vigorous study to open new and better methods through research in many fields. The huge new Volta Dam reservoir, which we saw in its initial stage of construction, will certainly give Ghana a great source of needed energy and a water supply for irrigation. But is water the only thing needed to increase the food production of the Accra plains? What can be done to solve the nation's protein deficiency?

Research is going on; it only needs greater en-

couragement. Interest in physics at the University is stimulated considerably by outside contacts since faculty members take turns in attending international conferences. Much of the work in process is sponsored by governmental agencies, the source of the relatively fine apparatus found there. The Department is in a strategic position in that the University is located nearly at the magnetic equator and hence has the natural laboratory of the earth's huge horizontal magnetic field. Work is primarily directed toward fields in which Ghanaian scientists can develop data not obtainable elsewhere. Papers have been published relating the equatorial effects in irregularities in the ionosphere, the pulsations of earth fields, and earth currents. There is a continuing study in radio astronomy.

Higher education in Ghana is being pushed rapidly. New junior colleges are being established, night classes at the University are contemplated, and there is hope, and a great need, for a science museum at Accra. Some of my extracurricular time was spent in discussions and conferences dealing with these matters. There is great pressure to replace the present primarily European faculty of the University with Ghanaians. One can understand the desire to do so. If, however, it is done too rapidly, since there are not adequate or suitable replacements at present, the University will suffer a decided setback. Evidently the students recognize this. It was startling to see a group of Ghanaian students at a convocation display a sign reading in essence, "We want an outstanding faculty selected without color or national discrimination." Discrimination can work harmfully in both directions.

As far as teachers are concerned, it appears that the greatest need in the Ghana school system is for an adequate teaching staff for the elementary schools. Since Ghana gained her independence from Great Britain in 1957, Nkrumah has pushed through a law requiring universal elementary education. It was interesting to see, on trips about the country, new mud buildings on the edges of villages which were identified to us as newly built schools. Seeing the many uneducated people in these villages and the teeming unschooled population of Accra, estimated at 150 000 persons, makes one aware of the awesome task facing the nation's leaders. The work of the Peace Corps appears highly appreciated, but Ghana needs a vast number of elementary teachers quickly, teachers schooled in Ghana with preparation tailored to their future needs. A selected few students may well be sent to foreign lands for their education,

but it will be some years before this recently awakened country can be expected to reach a level of development that will permit the full application of such training.

At present textbooks and reference literature written by foreign authors are used in the schools. These are not adequate for two reasons: the content is in part strange to the environment and not fitted to the need, and the cost is prohibitive. Perhaps some means of subsidizing local authorship and local publication can make more suitable books available to students and citizens.

Ghana's need for teaching apparatus is so great that one cannot imagine supplying it even by governmental gifts. Perhaps we can help them produce their own by pushing two projects: (1) A program to prepare and supply (complete with drawings) descriptions of very simple and basic teaching apparatus which they can build. This must be carefully planned to meet the limited supply of materials and construction skills available in Ghana. (2) A program for producing plan sheets of other experimental apparatus that requires inexpensive parts, indicating where they can be purchased and the approximate prices involved. Help sheets not only for construction, but also for teaching, should accompany this material.

In terms of the history of man, it was only yesterday when slaves were sold, by their own people of other tribes, at Salaga near the center of Ghana and then driven to the slave forts along the coast for export. Some of these slave gangs were probably met on the trails of the Accra plains by the early missionaries trudging inland to establish their churches and mission schools, and facing a drastically shortened life expectancy. We visited the inland area of the great slave market. In the forts along the coast we walked through the dungeons where the slaves were held captive. We saw the tombstones of the early missionaries and of their wives, inscribed with age dates so young that one could scarcely imagine a devotion to a cause sufficient to pay so great a price. And next to these graves stood the mission schools, the source of Ghana's modern educational system.

We are profoundly involved in Africa's fate whether we like it or not. Africa has been thrust into a modern world created almost entirely by the ideas, the history, and people of the West. There is assurance of friendship in the cooperative effort to help the new nations in becoming self-sufficient and independent, and to contribute to that effort is the only respectable road we may walk.