distillation. Extension of this technique to aqueous detergent jet scouring is also taking place. Both methods have been found to cause less felting than when the wool is scoured in the normal way. This leads to better processing performance with less fibre breakage in subsequent carding and combing. Lanolin recovery and utilization is also another activity. Methods of purifying and bleaching lanolin have been developed and utilization of various fractions is now being investigated.

Research on worsted carding has shown that addition of 0·5 per cent lubricant of about 30 centipoise viscosity greatly improves carding performance, reducing fibre breakage and waste. This was predicted from fibre-metal frictional measurements and then confirmed in processing trials. Studies on friction are being extended along more fundamental lines investigating short-term high-temperature rises occurring at contact points when fibres are rubbed. This is part of a general programme related to the drafting of fibres in worsted processing.

Apart from improving existing machines, research is also in progress on the possibility of elimination of some types of conventional equipment. In particular, there has been considerable work on developing an alternative to the worsted card, which causes large fibre losses and breakage when the wool passes through it. A machine known as the sliver converter has been developed for this purpose, of which an industrial prototype is at present under construction in the United States. The converter will occupy considerably less space than the card and should substantially reduce fibre breakage and loss.

The new laboratories will permit an extension of these activities and provide space for several additional projects.

# KUMASI CONFERENCE ON THE LAKE BOSUMTWI CRATER

By S. O. BAMPO

Department of Crystallography, Birkbeck College, University of London

At the fourth conference of the West African Science Association, held at the Kwame Nkrumah University of Science and Technology, Kumasi, Ghana, during March 22–26, scientists from parts of West Africa, Europe, China and U.S.S.R. were represented. The conference this year had as a central theme the question of the origin of the Lake Bosumtwi crater. This was of particular interest owing to the recent controversy on the volcanic or meteoritic origin of isolated craters. The discovery of coesite in a specimen from the Bosumtwi site (1961) has led to the suggestion by Dietz, Chao, Litter and Fahey[1] that the depression has a meteorite impact origin. This is in contradiction to the crypto-volcanic origin theory proposed by Junner[2] in 1933.

Lake Bosumtwi is situated in the central part of Ashanti in Ghana and lies on lat. 6° 30′ N. and long. 1° 25′ W. It is fairly circular in shape with a diameter of about 6½ miles. The crater base stands at a depth of 1,150 ft. from the raised rim of the depression, which is carved out of lower Birrimian (Pre-Cambrian) rocks. No lava flows have been found in the intensive geological surveys made so far. However, small deposits of brecciated conglomerates and tuff have been discovered[2] near Mmorontuo village, about 1½ miles from the crater, and in the Boni stream north-north-east of the crater. A correlation has been drawn between the analyses of some of these breccia and dacite from Scotland. An aerial magnetic survey of the lake district in 1962 has revealed a negative anomaly of amplitude 40 gammas striking in an east–west direction inside the crater.

Among the distinguished visitors to the conference was Prof. Gentner, director of the Max-Planck Institute for Nuclear Research, Heidelberg, who has for the past two years been working on the dating of tektites using the potassium–argon method. Large numbers of tektite finds have been dated by Profs. W. Gentner and Zahringer, including the Ivory Coast tektites (Ouelletites), which have been estimated to be 1·3 m. years old. These tektites have been associated by Cohen[3] with the Bosumtwi depression based on the terrestrial impact origin of tektites. In connexion with the various groups of tektite ages, Prof. Gentner discussed the several hypotheses concerning the origin of tektites.

Prof. Th. Monod, the director of Institut Français d'Afrique Noire, University of Dakar, read a paper on craters and astroblemes—general problems and West African structures. In this group he included the Bosumtwi feature and the Aouelloul structure in Mauritania, which is considered most probably to be an astrobleme. He has in preparation also a list of various astroblemes and their statistical data, which when completed may be a very valuable contribution to this type of investigation.

I, now on leave from the Kwame Nkrumah University of Science and Technology, read a paper on the Bosumtwi crater, in which the problem was examined in considerable detail.

In my paper, claims for a volcanic origin of the Bosumtwi issue were discussed. This was necessary because Maclaren in 1931 had proposed a meteorite impact theory which was dismissed at the time on account of the paucity of evidence of meteorite fragments and any other indication of meteorites. Apparently, the discovery of the deposits of Mmorontwo conglomerates (1932), including the analysis of a black, glassy material which looked like dacitic pitchstones from Scotland, seems to have strengthened the crypto-volcanic theory suggested by Junner.

I suggested that in the light of the present knowledge of such structures, it has been found that the absence of large deposits of volcanic material around such structures may not be strong enough evidence for all the structures to be attributed to volcanic origin. In addition, since Ghana lies outside the region of volcanic activity in Africa, a volcanic theory would need to be treated with caution. Secondly, the black dacite-like material examined appeared to contain about 3 per cent more water below 110° C than the Scottish dacites with which they have been compared. Differences in iron and magnesium contents of the specimens were also noticed. I discussed experiments on high-speed impact by Charter and Summers[4], from which I drew a correlation between known meteorite crater and experimental crater depth–diameter curve. I suggested that the Bosumtwi crater, if it had been of impact origin, would most probably have been formed in the fluid impact stage; and that the accompanying high velocity and pressure on the projectile would have caused it after impact to behave more like a fluid than a solid body. From this I went on to discuss the theory of crater formation by the hydrodynamical approach, as suggested by Culp and Hoope[5]. This was based on the development of shock-wave fronts in the fluid resulting in the production of minerals of rare density and crystal structure under high pressures and temperatures. This was in agreement with similar analyses by Staninkovich and Fedynskii[6], who postulated that when a meteorite hits the Earth with a velocity greater than 4 km/sec it might explode after impact to produce a large crater.

Among other topics I discussed was the Ouelletite spray field; the existence of good specimens of shatter cones probably need much more investigation. Stressed also was the possibility of recognizing altered meteorite fragments. This, I suggested, might need many more tools than the ordinary microscope; X-ray, electron microscopy and infra-red spectroscopy may need to be used.

I directed attention to the elliptical distribution of alluvial carbonado-type diamonds in Ghana which are associated with Recent conglomerate Deposits and also with deep valleys, including the Bosumtwi crater.

Earlier in his report, the director of the Geological Survey Department, Dr. J. E. Kudjo, had mentioned the recent discovery of deposits of spodumene and columbite near Mankwarzi and more gold deposits in northern Ghana near Nangodi. In a visit to the lake by the delegates to the conference, interesting sites around the lake were examined and specimens were collected; a plane flight was taken over the lake.

A new survey of the lake district is now in progress. The dredging of the lake has been considered a possibility in the near future. It is hoped that a continuous record of the increase in level of the lake may be kept, and a careful analysis of the terrace beds may soon be made. There is much doubt at the moment as to whether the scattered quantities of iron-rich slags that exist in Ghana have been produced by large iron-smelting communities which lived in the dense forests long ago. A survey of the distribution and an analysis of these slags may also need to be carried out.

The Bosumtwi crater, owing to its relatively recent formation, may yet throw much light on the genesis of isolated craters. It would seem, therefore, that the Ghana Government, by initiating faster surveys to clear up the points still in dispute, would be rendering a service to world science.

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[2] Junner, J. R., *Geology of the Bosumtwi Caldera and the Surrounding Country* (1937).
[3] Cohen, A. J., *Sci. Amer.* (June 1961).
[4] Charter, A. C., and Summers, *Sci. Amer.*, **203**, 128 (1960).
[5] Culp, F. L., and Hoope, H. G., *J. Appl. Phys.*, **132**, No. 11 (1961).
[6] Krinov, E. L., *Principles of Meteoritics. Intern. Series of Monographs in Earth Sci.*, **7** (Pergamon Press, 1960).

# MEDICAL RESEARCH IN THE BRITISH CARIBBEAN

THE eighth annual meeting of the Standing Advisory Committee for Medical Research in the British Caribbean was held in Trinidad during April 27–30. The meeting was formally opened by His Excellency the Governor General, Sir Solomon Hochoy, and addresses were also given by the Acting Minister of Health and Housing, Mrs. Isobel Teshea, the pro-vice-chancellor of the University of the West Indies, Dr. H. D. Huggins, and Prof. M. L. Rosenheim.

As Prof. Rosenheim indicated in his address, medical research is not necessarily dependent on the provision of expensive facilities. In this regard the identification of a hitherto undescribed cardiomyopathy by members of the staff of the Department of Medicine, University of the West Indies, and of the Medical Research Council Epidemiological Research Unit, is noteworthy. The topic of the scientific meeting was "The Child in the West Indies", and forty papers were read; fourteen from Trinidad, sixteen from Jamaica, four from Barbados, two each from British Guiana and Puerto Rico, and one each from St. Vincent and Grenada. This wide representation reflects the encouragement given by the Committee to medical officers in the area to undertake research and to report their results at this annual meeting or in the scientific press. The quality of the work presented was commendably high.

The first session was concerned with accidents and preventable disease in children. Papers by Drs. Wynter and Burke from Jamaica and by Dr. Ratan from Trinidad demonstrated that kerosene poisoning is by far the commonest accident in the area, but only one out of 224 cases died. Accidents at home are very common, but since other diseases such as gastroenteritis, bronchopneumonia and malnutrition are still commoner, only 7 per cent of the admissions to the children's ward in Jamaica were due to accidents. Dr. Eric Back reviewed the changes in disease patterns in children at the University since 1955. The session ended with an interesting comparison between a paper by Dr. Massiah of Trinidad and Dr. Byer of Barbados. Dr. Massiah showed that it cost more to treat the cases of diphtheria and tetanus which occur in Trinidad than it did to conduct an immunization campaign against diphtheria, tetanus, whooping-cough and poliomyelitis, which is protecting about two-thirds of the population of Barbados. Dr. Byer demonstrated that the immunization campaign had very significantly reduced the incidence of these diseases over a six-year period, so such a campaign is not a luxury but good economics as well as good medicine.

The second session was on viral and bacterial diseases, and included reports on the epidemics of poliomyelitis in British Guiana and eastern equine encephalitis in British Guiana and Jamaica. The Trinidad Regional Virus Laboratory and the Department of Microbiology at the University of the West Indies again proved their value by swiftly identifying the organisms in these outbreaks, and also by proving the first reported human case of rabies in Grenada. Dr. Walter Singh from British Guiana gave two papers, one on the clinical aspects of the polio epidemic and the other on congenital cataract and heart disease following an epidemic of rubella in British Guiana in 1962. Among bacterial disease in the tropics gastroenteritis is the great scourge of the pædiatrician. There is probably no hospital in the Caribbean which has room for all the cases of infantile gastroenteritis which should be admitted. The renal and cardiological complications of this disease were discussed by Drs. Ward and Christian of the University of the West Indies.

At the third session, on nutrition and child welfare, the remarkable efficiency of the Barbados Public Health Service was again demonstrated by statistics from their welfare clinics. Dr. Diggory of Trinidad gave an interesting paper on the very difficult problem of health education in a rural community. Drs. Garrow and McLean, of the Medical Research Council Tropical Metabolism Research Unit in Jamaica, discussed the in-patient management of kwashiorkor and marasmus. Severe infantile malnutrition carries a mortality of 10–20 per cent even in the most successful units, and the cause of death is not understood and prognosis is difficult. Dr. Usborne tackled the question of out-patient management of infantile malnutrition in a very practical way. By skilful use of cheap local food she devised a diet costing about five shillings per week per child, and with it showed very good results among her out-patients in St. Vincent. Unfortunately, proprietary baby foods are so effectively advertised that mothers spend far more than five shillings per week on small quantities of expensive preparations which they then have to give in homoeopathic amounts. Nutrition survey results were reported from Barbados and Puerto Rico, and the session ended with a paper on population control in Barbados. This is the most densely populated