CORRESPONDENCE

Development or Exploitation?

SIR,—Recently (April 28) the weekly magazine *West Africa* published an editorial reviewing Sierra Leone's progress during its first year as a Republic. The editorial suggests that: "Economically the future is much brighter than it was a year ago. The diamond slump is ending; Delco, the iron-ore producer, is expected once more to become profitable; Diminco, the diamond mining company . . . has got off to a good start; large-scale rutile mining is expected to be resumed. The value of the diamond industry to the country is still heavily threatened, however, by illicit diamond digging and by smuggling. In agriculture progress remains slow, but the goal of self-sufficiency inside two years in the staple food, rice, no longer seems unrealistic, and, if Common Market obstacles are overcome, the future for the expanding cocoa and coffee crops is good." It then goes on to say that the value of agricultural exports declined by 26 per cent in the previous year and that the world recession in the diamond market had hit Sierra Leone badly. The article is cautiously hopeful about the future of Sierra Leone's economy.

Like most other countries in tropical Africa, Sierra Leone is dependent on the export of raw materials (minerals and crops) to the rich nations of the world. Economists see the expansion of the EEC as a possible means of countries like Sierra Leone selling more raw materials, and, in the case of mining, this is often described as developing local industries. It is of course no such thing. The truth of the matter is that the more readily available raw materials are being exploited and exported as fast as possible and little thought is being given to the conservation of resources for any future development of manufacturing industries. It seems that we in the developed world are keen to cream off the raw materials in under-developed countries in order to satisfy our own needs as consumers. We seem content to condemn the under-developed countries to the role of producers of raw materials.

It might be (as argued by John Maddox, *Nature*, **236**, 331; 1972) that price and demand are likely to shape the future availability of raw materials, but is it reasonable for the profiteers and consumers of the rich countries to persuade or to force the under-developed

countries to sell the best of their resources as quickly as possible? Would it not be more reasonable if a massive effort were made to enable the poor countries to develop real industries rather than to remain as producers of raw materials? If this were done the profits of the already-rich would be reduced and the Common Market might not expand quite so quickly as politicians and businessmen hope, but at least there might be a slight chance of real development in the poor countries.

Yours faithfully

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Educating Scientists

SIR,—The education of scientists is as unscientific today as ever it was. And it is poor consolation that education generally has remained an empirical study, dependent for its success on the devotion or genius of its, usually, unsung heroes.

Your report¹ of A. D. C. Peterson's plans for a "generalist" degree in "Education and Engineering" is yet another evidence of the confused thinking of educationists everywhere. In Australia, first degrees are as unspecialized as any generalist could wish, but in times of recession, or fear thereof, graduates are looking for jobs. Furthermore, the generalist training is far from successful in "teaching students to think". From practical experience, the more rigorous requirements of a specialized honours programme are preferable to the tentative probings of a broad pass degree course, especially in preparation for a "general profession" such as librarianship, where the prime requirement is to acknowledge the ways in which other people think.

Highly technical professions require specialized training, and our social and economic system depends upon an adequate supply of highly qualified graduates in natural science, engineering and so on. However, it is yet to be demonstrated that society itself is as amenable to objective study as the environment in which we exist. Education, general or specialized, does little to develop judgment, intuition, imagination or common humanity. And to develop an appreciation of the com-

plexity of situations, and the possible extent of knowledge, a study dedicated to a narrow field is far superior to a "grab of superficialities."

Universities, and Oxford of all has been the doyen in this respect, can leaven the specialist study through the experience of an academic society. Peterson should look again before asking others to leap onto the educational roundabout where theories come and go with cyclical monotony.

Yours faithfully,

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¹*Nature*, **236**, 321 (1972).

Tenure Decisions

SIR,—I wish to comment on the editorial "Is Tenure Tenable?" (*Nature*, **236**, 261; 1972). Abandonment of the tenure system in favour of limited periods of engagement would seem an admirable experiment. I disagree with the editorial, however, regarding the corporate review of re-appointments. In my opinion a corporate review might deal unjustly with those who have made valuable contributions to a university. During periods of extreme economic stress, as we are experiencing in western USA, review procedures can degenerate to the level of public lynchings. To safeguard individuals with limited engagements from arbitrary and capricious corporate action it will be necessary to publish and enforce codes of ethical corporate action in matters of appointment and renewal. Administrators or departments who abuse established review procedures should be considered "Schreibtischtäter" (administrative crooks) and called to account for their actions.

Yours faithfully,

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Pesticides and Man

SIR,—John Maddox (*Nature*, **236**, 436; 1972), in discussing untoward effects of persistent pesticides, states, "There are the strongest possible reasons for pre-

serving as many living species as possible, if only for aesthetic and historical reasons". This excellent statement is followed by one which may, I believe, cause some confusion, namely, "There is however, no reason to think that the damage done to the populations of wild birds by pesticides is as yet comparable to the damage done by hunting, thought to be responsible for the deaths of 2 million game birds a year in North America alone . . ."

To the hunter, and to the game manager, the new environmentalist could and should be a most valuable and numerous ally. How regrettable it is, however, that the sport hunting of game under prudent management schemes now in almost universal application is so often accused of hastening the destruction of species! Let us not forget that North America would never be supporting its abundant game populations were it not for public, and specifically hunter, demand. I can assure your readers that legal recreational cropping does not and cannot endanger the continued existence of any North American game bird. Persistent pesticides, however, are believed responsible for the near complete disappearance of the peregrine falcon from most of its world range, and, as John Maddox points out, for low and possibly decreasing recruitment rates in other species as well.

The "damage" done to cattle populations by butchering is incomparably greater than that done by anthrax. Which, however, demands our greater effort and attention? The definition of the issues is, I believe, the most fundamental problem facing environmental scientists.

Yours faithfully,

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Population

SIR,—While welcoming the recent decline in the birth rate in England and Wales, we are disturbed at the assumption by Mr Wynn in your correspondence columns (*Nature*, 236, 181; 1972) that this is a continuing trend which will automatically lead to long-term stabilization of our population. Demographers do not base their projections on the crude birth rate in any one year, which fluctuates considerably, but on available data on long-term fertility trends, such as the "Family Intentions" Survey¹ mentioned by Aubrey Manning, showing that the "ideal completed family size" desired by women is 2.5 children and that "without economic constraints" this rises to 3.5 children.

We now appear to be experiencing a similar phenomenon to that of the 1930s, when generally adverse economic conditions and widespread unemployment caused parents to postpone their family building. At the time it was feared that a falling birth rate might lead to a decline in population, but the birth rate did not at any time fall to the same level as the death rate. Consequently the long-established trend of natural increase remained uninterrupted², and, as we all know, population has grown considerably since 1931. It would seem that today's "relatively" low birth rate is due not to any desire by parents to have replacement-size families, but to decisions "not to have another child until things get better". Economic factors clearly do affect the birth rate, but who would recommend permanent and widespread unemployment as a desirable method of population control? Neither can it be said that, at this level, it is an effective method—it is worth noting that natural population increase is still running at over 100,000 per year³ and that any increase, however small, cannot be sustained in the long run. With increasing absolute numbers of women entering the child-bearing period, a further decline in the birth rate will be necessary to keep the absolute number of births stable at any given level. It will be interesting to see what happens during the next few years.

Yours faithfully,

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¹ Family Intentions, Office of Population Censuses and Surveys (HMSO, 1971).

² Parsons, J., *Population versus Liberty* (Pemberton Books, 1971).

³ Registrar General's Weekly Returns for England and Wales (1972).

PCBs in Copying Paper

SIR,—From the article by Masude, Kagawa and Kuratsune on PCBs in carbonless copying papers (*Nature*, 237, 41; 1972), your readers might receive the impression that PCBs are currently used in carbonless copying papers and, by implication, that users of these types of papers might be exposed to toxic hazards similar to those reported in the mass intoxication incident in Japan in 1968.

In view of the current very understandable concern over the question of environmental toxicants and the viewpoint expressed in *Nature* (236, 433; 1972), we feel that the facts relating to the use of organic solvents in carbonless copying systems should be made known to your readers.

Wiggins Teape are the largest manu-

facturers of carbonless copying paper in Europe, and when PCBs were first reported as persisting in the biomass (*New Scientist*, 32, 612; 1966), the use of these solvents was reconsidered. The Yusho poisoning incident was taken into account, but as this was due to a higher chlorinated PCB with different toxicological characteristics from that used in copying systems, this was not considered to be of direct relevance; considerable toxicological investigation had been undertaken by Wiggins Teape in conjunction with Inveresk Research International on the lower chlorinated PCBs used in copying systems, and it was shown that the use of low chlorinated PCBs as solvents presented no hazard to man in the form and amount used.

Nevertheless, in view of the possible but unascertainable hazard to the environment in the long term, it was decided to seek an alternative solvent for use in carbonless copying systems.

A suitable solvent with similar physical characteristics was chosen and extensive toxicological tests were carried out to establish rapid biodegradation and freedom from toxicity.

Since June 1970, no PCBs have been used by Wiggins Teape in the manufacture of carbonless papers, and we know that other responsible manufacturers of similar papers have followed our lead.

Yours faithfully,

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Knuckle Walking

SIR,—E. N. Tiratsoo asks (*Nature*, 236, 472; 1972) whether the knuckle-walking situation of football linesmen is different in Chicago. It is indeed, with respect to both "football" and "linesmen". In American football, a line-man is one of the players, often bearing a marked physical resemblance to one of the larger anthropoid apes. At numerous intervals in the course of play he will assume a crouching three-point stance, the forward support being the knuckles of one hand. During these intervals knuckle-walking may occur. This is an unsanctioned activity and may result in a penalty to the offender's side if detected by an official.

Yours faithfully,

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