the concept of true science or true humanism or misunderstanding of certain value systems.

Familiarization with the moral objections to utilization of certain contraceptive methods reveals that the concept of totality of marital love demands the complete oblation of the entire persons in such a sublime communion. The theologian R. A. McCormick, S.J., has recently discussed the Catholic position in some detail ["Conjugal love and conjugal morality," *America* **110**, 38 (1964)].

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Hazards of Pesticides

Thanks are due to Elinor Langer and *Science* for the description (News and Comment, 3 Apr., p. 35) of the Lower Mississippi fish kill by pesticides. Information on this very serious state of aquatic affairs is much needed, and it is to be hoped that *Science* will continue with other articles as new information develops. This Lower Mississippi fish kill would seem to be so important that it is surprising that it is not first-page news all over the country.

Since Rachel Carson's *Silent Spring* there has been a rash of pamphlets attempting to justify the widespread use of pesticides. These publications make interesting reading in the light of recent events in the Father of Waters. In spite of repeated assurances that endrin and dieldrin were safe, obviously they are not safe. They have not been adequately tested. Have any of the new insecticides been adequately tested? Perhaps this is a good time to rethink the problem of release of poisonous materials in the environment. A few suggestions for changes in the program might be in order:

1) Stop the use of endrin and dieldrin immediately and destroy all stocks of these poisons. They are obviously too persistent and too dangerous to use.

2) Restudy all insecticides which are persistent enough to show any accumulation from season to season in soil, water, or organisms.

3) Retest all insecticides. Those in use have been declared "safe." Safe for what? Man only? It is possible that long-term ecological effects of the use of these materials may be more detrimental than the effects of the insects they control.

4) Greatly expand research into methods of biological control of individual species of pests. Species differ in structure and function or they would not be called species. Concentrated study of each species may show points of attack by which the species may be controlled without playing havoc with the rest of the environment.

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I believe that a publication like *Science*, which is for people presumably dedicated to objectivity, should be above such articles as the one by Elinor Langer headed "Pesticides: Minute quantities linked with massive fish kills; federal policy still uncertain." The article begins by stating as fact something which has been very carefully qualified in several other reports. It goes on to present a distorted point of view and condemns the role of government in regulating pesticide usage as "weak and confused," "piecemeal and inadequate"; "results are often dissipated in political and bureaucratic bickering." This seems grossly unfair, unless one believes that any commercial product should be banned by Washington edict upon receipt of the first report that it might be causing trouble. The article leaves the impression that the various programs for registration, recommendation, and use of pesticides are haphazard and based on inadequate evidence, when in fact they constitute one of the best-ordered complex undertakings in our society.

The use of pesticides is essential for the continued production of food and fiber crops, for the protection of human health through control of lice, flies, rats, cockroaches, and for such miscellaneous purposes as control of undesirable species of fish. The state agricultural experiment stations, the United States Department of Agriculture, and the Food and Drug Administration all have very strong programs aimed at the control of pests with minimum danger to the crop or to the consumer. Any change in those programs should be based on a careful evaluation of facts, not on emotions or possibilities.

No responsible official will deny that some pesticides, especially when misused in high concentrations, can be dangerous. The public has a right to know about this danger, and people are being warned repeatedly in every possible manner. However, in our worry about this problem, let's not lose sight of the fact that we must have food and clothing from crops whose production would be impossible or much more expensive without pesticides. In particular, the city dweller should be given a balanced account of the situation, because he knows the least about agriculture.

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Lewis's suggestion that the Mississippi fish kills are the "first report" that the pesticides in question "might be causing trouble" seems to me to overlook substantial information acquired by the Fish and Wildlife Service and by independent investigators, not to mention Rachel Carson and the President's Science Advisory Council panel. Also, although Lewis's loyalty to the Department of Agriculture is commendable, not even Secretary of Agriculture Orville Freeman would care to defend the thesis that the registration of pesticides "constitute[s] one of the best-ordered complex undertakings in our society." In testimony before a subcommittee of the Senate Committee on Government Operations on 15 April, Freeman described how a proposal, which he favored, for more exchange of information between federal agencies on pesticide registrations had been held up since last June by "the usual pulling, tugging, and hauling that goes on between government departments." He also acknowledged that coordination among federal agencies in investigating the fish kills had been "very poor." Trembley will be pleased to note that Freeman also called for a crash program to develop environmental and biological methods of pest control.—ELINOR LANGER

Multiple Authors and Indexes

I would like to amplify Page's theme in his editorial "Some perils of authorship" (10 Apr., p. 139) with pragmatic, though tangential, information. Although Page examines policies pertaining to primary publications, he neglects the important subject of secondary publication through indexing and abstracting media.

Here the problem of sheer bulk rears its head. At least one major index, *Index Medicus* published by the National Library of Medicine (NLM), has been forced to make an arbitrary decision regarding publication of the names of multiple authors. As of January 1964, *Index Medicus* will list all authors only when there are three or fewer. When there are four or more, only the first three authors' names, followed by *et al.*, will appear in the "names" section, as well as cross-references from the second and third names. The authors omitted will be given credit only in the somewhat inaccessible magnetic-tape master records permanently on file at NLM. NLM's primary reason for this decision is that so many papers today have multiple authors that the consumption of space by printing all names would have precluded its planned expansion of journal coverage. Forced to choose between enlarging journal coverage, that is, the amount of information available to medical scientists, and giving full printed credit to all authors, NLM made the only possible choice.

Here is another reason that the order of names in a by-line should be closely examined, at least by medical authors.

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The question raised by Irvine H. Page (10 Apr., p. 139) with respect to the number of authors' names and their arrangement is one that has to be faced with each new article submitted for publication. It seems trivial but is not, for if the number of authors should be arbitrarily limited to one, the motivation and interest of others in making contributions to the improvement of the article would be decreased and the published article would therefore not be as good as it might have been.

After much discussion of this question in our laboratory, we have arrived at the following conclusions. Each published article should include as authors all those who have made substantial contributions to the work involved in its creation, and lesser contributions should be acknowledged in footnotes or at the end of the article. The authors' names should appear in the order of the magnitudes of their contributions to the creation of the final article. The first author would therefore be the one who is primarily responsible for the results and conclusions, but each of the other authors must accept a proper share of the responsibility for the validity of the work.

No arbitrary limit should be set by journal editors for the number of authors of a scientific article, heads of laboratories should not "almost routinely put their names first," no author's name should be put first just because he or she "was young and needed the push," no person's name should be omitted if he or she has made a substantial contribution, and no person's name should be included if he or she has not made such a contribution.

The best procedure is that which will result in the publication of the best articles.

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Standard Sampler for Assay of Airborne Microorganisms

An International Aerobiology Symposium, sponsored by the Office of Naval Research and the University of California, was held on the Berkeley campus in October 1963. During this meeting an open discussion of problems involved in sampling airborne microorganisms brought forth the following general agreement:

1) That sampling, as now conducted, is essentially an art.

2) That each investigator must, of necessity, employ the sampling procedure yielding the most productive and useful information for his purpose.

3) That the loss of viability incurred as a result of the sampling step is difficult to assess and may not always be constant.

4) That in studies of respiratory disease, the animal host is the ultimate sampler although animals cannot always be utilized for this purpose, especially in studies relating only to survival of airborne microorganisms.

5) That data obtained with any specialized sampler should be correlated with at least some results obtained in a similar manner with a standard reference sampler, in order that other workers may better judge the applicability of such data to their own investigations. The reference sampler chosen should be one that is widely used and readily available.

Therefore, the undersigned urgently recommend that reports of viable assay of airborne microorganisms include some data obtained with the AGI 30 Impinger (*1*) operated at an air flow rate of 12.5 liters per minute. The sampling medium, duration of sampling, the volume of medium, the collection temperature, and the holding time and temperature between the sampling and the assay should be stated.

In experiments where concentrations of cells are too low to be adequately sampled by the impinger, or where the number of airborne particles is being determined, it is recommended that the Stacked Sieve (*2*) sampler be employed and that the air flow rate and medium volume in each section be stated. It is recognized that samplers employing solid media may produce some viable loss of sensitive organisms, especially if the sampling operation is extended for any appreciable length of time.

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