000 provides for large-scale experiments with bait traps, to be carried on in two fruit sections, an area including 500 acres of peaches to be baited in each section. It is hoped that these experiments will answer the question which has long existed as to whether the use of bait traps over a wide area would give better results in the control of the oriental fruit moth than when a limited area of only a few acres is baited, in which case the surrounding unbaited area is in comparison very large. W. P. Yetter, Jr., has been placed in charge of the bait work. In addition to the maintenance of bait traps over large areas, important detailed experimental work is also contemplated. The localities selected for the work to be conducted during the season of 1930 are Cornelia, Georgia, and Vincennes, Indiana. The remaining $20,000 of this money is to be used to strengthen the work with parasites and insecticides and for a study of the ecology of the oriental fruit moth. The work with parasites and ecology is to be headquartered at Moorestown, N. J., under general supervision of L. B. Smith, and will constitute an enlargement of work already being conducted by Dr. H. W. Allen. The insecticide studies will be conducted at Vincennes, Ind., under the direction of Dr. F. H. Lathrop.

DISCUSSION

THE INTERNATIONAL CATALOGUE OF SCIENTIFIC LITERATURE AGAIN

THE proposal suggested by the Smithsonian Institution to revive the publication of the International Catalogue of Scientific Literature on a very modest but well-considered budget is a challenge to all scientists and librarians, and to all trust agencies which are spending good money for the promotion of research.

It is suggested that a revolving fund of $75,000 and one thousand library subscriptions of $50 for seventeen volumes will insure the enterprise. Whether or not this is enough is a detail. If this catalogue or something like it is an indispensable tool for research, as many first-class scientists seem to think, then any necessary amount should and probably can be had. If the catalogue is not needed, too much money is now being spent on it. Why waste more?

The Smithsonian raises this question plainly. Why ask the American government to continue to appropriate six or seven thousand dollars a year in the procrastinated hope of a resurrection, if the project is better dead? If it is needed, why procrastinate?

By putting the question the institution has deserved the thanks of all concerned. It is to be hoped that it will not let the matter rest until it has a square answer from all responsible parties. The history of the enterprise for ten years has been one of evasion, with preferential attention to other matters. Meantime a valuable asset of 2,500,000 manuscript titles, costing at least a million dollars, has lain unused and unusable, and another quarter of a million dollars more or less has been spent on half a million more titles, while marking time for responsible agencies to make up their minds or debtor nations to balance their budgets.

To a thrifty librarian the fact of these accumulated assets, together with the fact that the catalogue is a going concern with fifty to one hundred thousand dollars possible annual income, is the crux of the matter. The question raised by the Smithsonian is not the question of presenting a new project to be justified, financed and initiated, but whether perfectly good machinery worth at least $3,000,000 is to be scrapped, in an enterprise bound to be revived sometime, as Professor Armstrong, of the Royal Society, prophesies and as many scientific bibliographers in many countries are on record as believing.

It is at this point that the overture of the Smithsonian becomes a matter of practical business concern both to the research trust endowments and to the libraries. The research endowments are bombarded with bibliographical projects of varying method and degrees of merit. They aid or support a good many projects. They are deeply concerned as trust organizations to put their money where it will do the most good. Other things being equal they prefer to put it where one dollar will do the work of four. This seems to be a spot where one million, perhaps a quarter of a million, will do the work of four millions. If its usefulness merely averages with these other projects the endowments are likely to feel that its claims come first. It is here they can give the most bibliographical service with the least money. The proposition touches the libraries in a very similar way. If and when the matter is revived it will depend for financing, if not on the endowments, then on library subscriptions. If this machine is scrapped, when a new one is started either a $3,000,000 endowment must be had from promoters of research or a quadruple price charged to libraries.

This leads straight to the crucial question of whether the international catalogue is in fact a primary, essential or indispensable tool in such sense that it is bound to be revived sometime. It no doubt seems a futile and mortifying matter to those who have been deeply engaged in the problem for thirty years that they should have to rejustify and refight a

matter which was fought to the finish thirty years ago. But it is fair enough. It is not the only real bibliographical need of science. There are at least two other equally well-defined needs—abstracts and handbooks. Without disparaging the usefulness of these two other tools, it must be confessed that a good case is made by those who claim that something like the international catalogue is the essential and only indispensable tool among the three types.

A dispassionate general bibliographer must recognize that this is a conclusion towards which the whole history of bibliographical experience tends. The complete survey, in full title form, of the whole literature of any subject or group of subjects is the only solution of the main need of the student in research and in the higher learning, *i.e.,* completeness, and the best solution as to his need for a perspective.

The reason for this lies in the cooperative nature of advanced intellectual work. Intellectual progress, in whatever line, is based on gathering together the results of all previous intellectual work on a particular subject, large or small, surveying, integrating and building on this foundation. This collected and integrated material serves as a necessary basis both for those who, by teaching or reading, are at work turning scientific discovery into common knowledge, and for those who use the same integrated material as basis and point of departure for research effort to produce some new and useful variation, or contribution to the subject. If the research worker misses some result of work previously done, it involves at least the waste of having to do it over again, and it may involve loss of efficiency through the missing of some key fact.

The evidence that the full title method, as distinguished from the abbreviated or index method on the one hand and the annotated title or abstract on the other, is best, is that the title is just what bibliographical experience has evolved as the shortest description of the work or article which will serve. It is itself an abstract, made by the author himself to describe in the briefest way that he can devise what he considers the gist of the article. No other system of abstracts can pretend to describe a group of articles as well in the same number of words.

In short, bibliographical experience confirms the judgment that something "very like" this catalogue as to completeness is the essential, and full title method best, without prejudice as to variety in other details.

The obvious question at this point is, if the matter is so plain, in the nature of the case, in bibliographical experience, in the judgment of scientific bibliographers and users, in its financial aspects and in its waste eliminating and efficiency promoting character, why has the catalogue not been revived long ago?

There are in fact reasons which might well have hindered the most worthy of enterprises.

In the first place, there were the war debts. The temper of the congress of regional bureaus in 1922 was so decided in favor of revival that the committee appointed by it might likely have made progress in getting support from the respective governments for the overhead editing and printing also if it had not been for the war debt situation. The committee found on inquiry what has since been confirmed under renewed inquiry, that under the debt repayment condition it has been difficult enough to keep up on the work of the national bureaus and quite impossible to ask to add to the post-war budgets for overhead and printing in view of the sharp watch and criticism by creditor nations on all budget increases.

Another reason thought to be decisive by Professor Armstrong is the growing passion for specialization among scientists which makes them indifferent to the seeing-as-a-whole aspects, promotes a scramble for special privilege and blinds to the economies of wholesale and machine production in bibliography, as against desultory special bibliographies.

Again, the initial demand for a cool $1,000,000 ($75,000 per year for fourteen years) for publishing arrears was in fact a major deterrent. It is a sum big enough to give pause to any project and demand full justification before proceeding. The Smithsonian now proposes to cut this sum out altogether, leaving arrears to the future. At any event this problem of arrears could be fairly provided for by simply filing the cards as they are and organizing a modern library card and photostat information service, at a cost of 10 per cent. of the printing estimate.

Finally, there is the matter of means, or rather of connecting with the means, for it seems obvious that there is no serious lack of money for approved scientific bibliography. Very much more money is now spent for this in a desultory and competitive way than would be needed for a comprehensive wholesale handling.

There seems little doubt, if one can judge by the course of other events, that, if the above statement of the situation is sound, some agency for the promotion of research will be glad to furnish at least the minimum means. If it is true that the catalogue fills an essential need, in the best way, on a wholesale scale, which insures the most economical production and low cost to the user, by eliminating wasteful and ineffective casual effort, there is little chance that it will not find reasonable provision, if it can get an adequate hearing.

The problem is, therefore, to get the facts stated in a convincing way and presented by those who have the confidence of the promoters of science.

Of course the Smithsonian itself has its own prestige. It might use this prestige to induce the two great institutions organized for the promotion of cooperation in intellectual work, the League Committee and the National Research Council, to take up this particular question for definite consideration on its merits and to consider the whole situation of the bibliography of science in a broad way with view to inducing the cooperation or amalgamation of existing enterprises. This would reach one of two results: either the promotion of this project in its suggested form, or a modified form, perhaps a highly modified form, in which latter case it would inevitably lead to some project viewing the whole field of bibliography as one; or on the other hand, it would produce a responsible opinion against the catalogue which would justify the Smithsonian in abandoning the project and refusing to apply for further appropriations.

Scientific bibliography has the very high honor in bibliographical history of having been the first to conceive and to carry out on a large scale in the international catalogue the seeing-as-a-whole aspect of things which the modern school of psychologists is now exploiting. It would be an even greater honor if it should lead the promoters of research generally to apply the comprehensive method to other large fields.

ERNEST CUSHING RICHARDSON
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WHAT IS CONTROL?

WE fail to understand by what authority, or process of reasoning, Professor Woodworth[1] would limit the use of the term *control* to "definite conscious action of a rational being, something done by man for his own benefit . . . always something that carries out his will."

The dictionaries define control, *v. t.*, in part as follows: "to exercise a directing, restraining, or governing influence over; direct; counteract; regulate" (Standard); "to exercise control over, in restraining or checking; to subject to authority; direct; regulate; govern; dominate" (Century); "to exercise restraint or direct influence over, to dominate, regulate; hence to hold from action, to curb, subject, overpower" (Webster). One could scarcely formulate a truer picture of the present-day aims of economic entomologists, with reference to our insect enemies. Nowhere do we find a definition that restricts the term as postulated by Professor Woodworth. *Uncontrolled,* to our way of thinking, means a condition where control by man or by any other factor is not sufficient to restrain or dominate.

[1] SCIENCE, 71: 388, April 11, 1930.

Professor Woodworth apparently objects to including under control the action of parasites and predators. Certainly a parasite or predator which destroys a noxious insect is "counteracting," "curbing" and "exercising a restraining influence on" the development of that species. Whether or not it is conscious of what it is doing, or is carrying out its own will, makes no difference in the end result.

Is it not time that biologists, at least, should recognize that man is an animal and a part of nature, by discarding the term artificial for all his relations to the rest of the organic world? In a very real sense, man's fight against his insect enemies is as natural as that of a parasite or predator. Until we are positive that "definite conscious action" is found only in the behavior of the human species it may be unwise to emphasize unduly our separation from the rest of the animal kingdom.

We also fail to follow the connotation that remedies are necessarily eradicative. The term remedy seems to be used at present chiefly to designate pharmaceutical preparations or medicines used for the cure or relief of diseases or ailments. These, we are too sadly aware, are generally far from being eradicative. Remedies, like treatments, imply that the trouble which they are aimed to correct has already begun. Preventive measures, on the other hand, are anticipatory, and are aimed to ward off, or stop the trouble from happening, by the application of previous measures. Remedies, treatments, preventive measures, parasites and predators—all "counteract" or "restrain" the pests against which they are used, and therefore control seems to us to be the best general term.

We would include under the general comprehensive term insect control all adverse operations and ecological conditions that make life hard for insects, that tend to kill them or to prevent their increase in numbers or their spread over the earth. As so defined, insect control may then be classified as follows:

A. Applied control: measures that depend upon man for their application or success, and can be influenced by him to a considerable degree.
   1. Chemical control: the use of insecticides and repellents, substances that kill insects by their chemical action or ward them off by their offensiveness.
   2. Physical or mechanical control: special operations that kill insects by their physical or mechanical action.
   3. Cultural control: regular farm operations performed in such a way as to destroy insects or prevent their injuries.
   4. Biological control: the introduction, encouragement, spread and increase by human aid of