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.

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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

predacious and parasitic insects and other animals and insect diseases.

5. Legal control: the control of insects by controlling human activities.

B. Natural control: measures that do not depend upon man for their continuance or success, and can not be greatly influenced by him.

1. Climatic control: the restraining influence of cold, heat, winds, storms and other adverse weather factors.
2. Topographic control: the restraining influence of natural barriers, such as oceans, rivers, mountains, unfavorable vegetation or soil.
3. Biological control: the operation, without human aid, of the parasites, predators and insect diseases naturally present in any region.

We believe that there is a perfectly good reason why "the term control . . . has finally practically displaced the older term" and why less than 5 per cent. of recent writers on insects and fungi are using other terms in place of it.

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THE appearance of an article entitled "What is Control?" by Professor C. W. Woodworth in a recent issue[1] raises an interesting point. If natural control, as a term, be discarded, as suggested, what substitute may best be employed in less technical bulletins of experiment stations and the like to designate those factors of nature which exert a restraining influence upon organisms, such as injurious insects and fungi, which are the subjects of such publications?

Chapman, Graham and others have developed the term environmental resistance, which has been defined[2] as "the sum of all the factors in an environment that tend to reduce the rate of insect multiplication." These factors are physical, biological, etc. This term, environmental resistance, which is, perhaps, more inclusive in scope than the connotations associated with natural control by some, might well be used exclusively in place of the latter; "natural control," however, is often useful. The impression has been gained that natural control, as a term, need not be abandoned on the basis of the argument of the article mentioned.

After a lucid and rather satisfying explanation of how "control" has supplanted such medical expressions as "remedy" and "preventive," Professor Woodworth concludes that "natural control . . . should disappear from the literature of entomology" because, as a term, it is considered self-contradictory and the equivalent, etymologically, to non-control. This objection is based upon the concept that, since the influence of those factors which, properly, may fall into this category is exerted quite independently of man, no control has operated, *i.e.*, control is not control unless initiated, directly or indirectly, by man (or by some other intelligence in the universe acting for the benefit [?] of man), and control "is always something that carries out his will."

This limited and anthropomorphic construction of control is not supported by the opinions of certain lexicologists. Two dictionaries, taken at random, define control as "a check," "a restraint," "the power of keeping checked," "a regulation." No express statement that only man (or a superhuman entity) can exert such an influence is usually to be found; indeed, "one who or *that which* controls"[3] has been noted.

In the article cited, it is further stated that "uncontrolled . . . is almost universally expressive of the action of nature where a control by man is not exercised." If it be granted that this usage may hold generally—though, strictly, it does not hold exclusively, and one may conceive of non-human limiting factors that may not, or have ceased to, operate—it still need not invalidate the term natural control. Philological studies have shown the essential plasticity of a living language, as witness *sanguine,* originally *bloody,* then *abounding with blood,* finally *cheerful, hopeful, confident.* As the remark of a colleague implies, the points made against the use of the term natural control might hold with at least equal force (or lack of force) with "natural selection." The article cited does not challenge the fitness of this particular term, which has achieved virtual universal acceptance and which may be said, conservatively, to be good usage.

If "control" may be used as it has been defined: a check[4] or a restriction, it then would seem not excessively arbitrary to add "natural" (belonging to nature, not artificial) to obtain an expression descriptive of such natural factors as parasites, predators, lethal temperatures, fluctuations in the food supply, *et al.,* which—from the view-point of man—do much to limit the injuriousness of certain insects, fungi, etc. In view of the usages of indirect and direct control, chemical and biological control, etc., it should not be amiss to retain, as an antithetical expression for artificial control, the simple and reasonably self-defining term, natural control. It is in just this sense that such eminent entomologists as W. R. Thompson and F. Silvestri have used natural control.

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

[2] S. A. Graham, "Principles of Forest Entomology," p. 32, McGraw-Hill Book Company, New York, 1929.

[3] Funk and Wagnall's Desk Standard Dictionary, p. 188, 1915.

[4] Incidentally, "check" has at least two meanings for which "control" is used synonymously, *viz.* (1) a restraint, (2) the untreated unit or phase in an experiment.