The Principles of Humane Experimental Technique

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CHAPTER 1

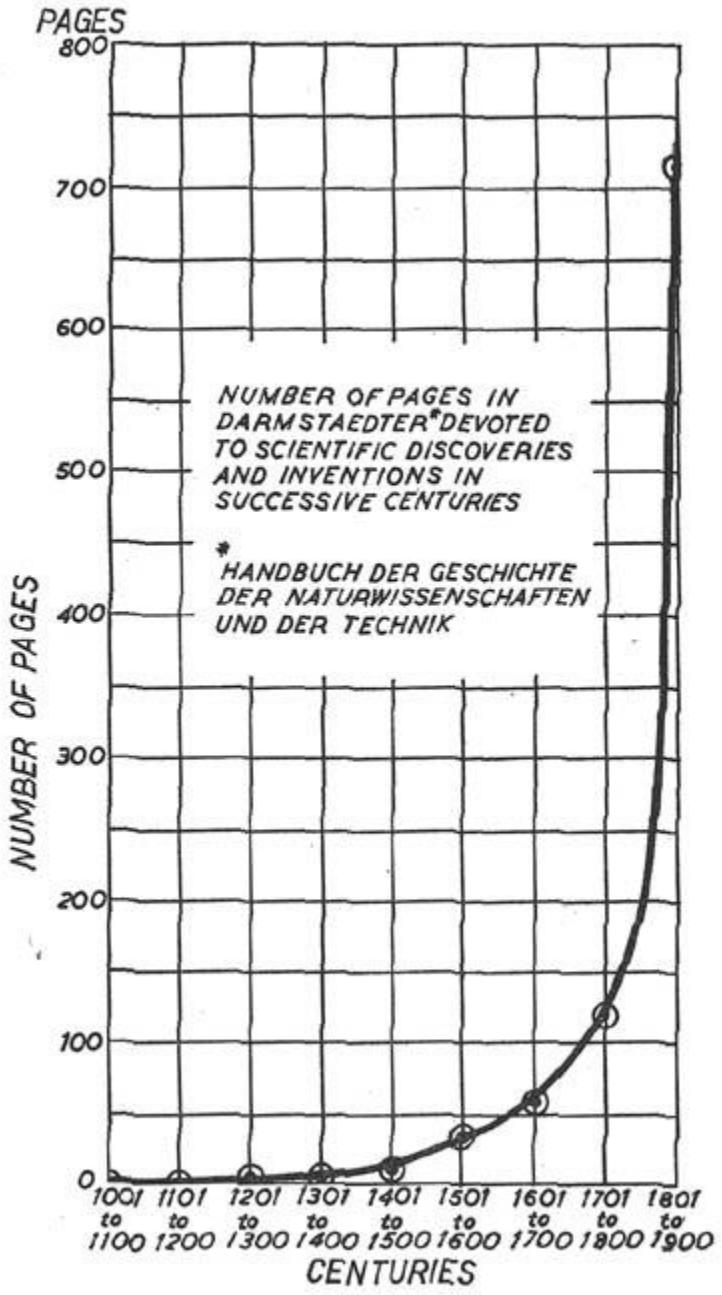
Introduction

Under any excitement there will be much mutual action and reaction between these ... organs of the body.

Scope of the Study

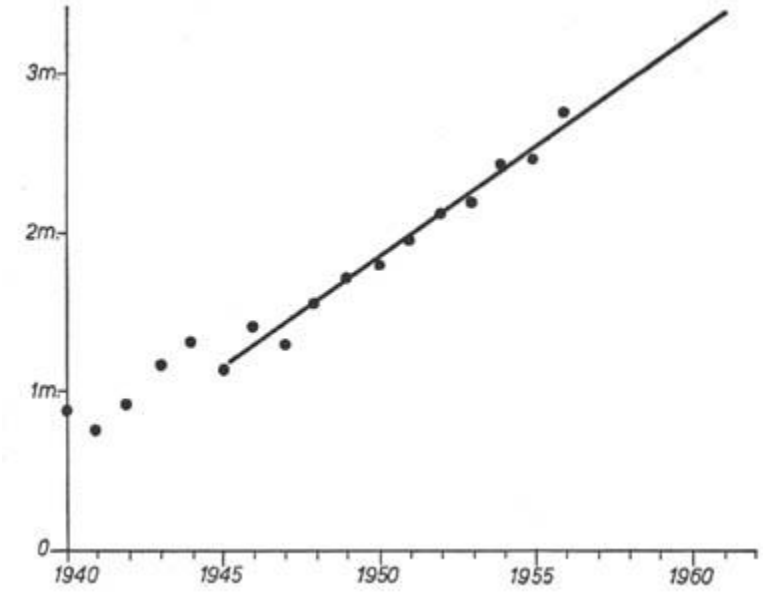
The rising curve of scientific research, both fundamental and applied, has long since become steep in terms of the individual human lifetime (see Fig. 1a), and the explosive expansion of the past hundred years has been so often the subject of remark that we are beginning to take it for granted. Since the impetus afforded by Darwin, the biological sciences have shared in this expansion. In particular, the growth of medical and veterinary research and of the pharmaceutical industry has brought about a vast increase in the numbers of nonhuman animals employed as the subjects of experiment. These numbers have long been reckoned annually in millions, and such systematic records as we possess show that they are rising steadily (see Fig. 1b). It is a truism, though one cannot too often be repeated, that we owe to animal experimentation many if not most of the benefits of modern medicine and countless advances in fundamental scientific knowledge. It has sometimes seemed that there is an irreconcilable conflict between the claims of science and medicine and those of humanity[1] in our treatment of lower animals. When, in the late nineteenth century, this conflict appeared to come to a head, the British genius for compromise asserted itself, and the famous Cruelty to Animals Act of 1876 balanced the rival claims (cf. Hume, 1947b, 1957d). Even at that early date, it was to some extent apparent that the wages of inhumanity were paid in ambiguous or otherwise unsatisfactory experimental results. The conflict disappears altogether on closer inspection, and by now it is widely recognized that the humanest possible treatment of experimental animals, far from being an obstacle, is actually a prerequisite for successful animal experiments. Since the Second World War, in particular, this principle has been increasingly accepted; and the intimate relationship between humanity and efficiency in experimentation will recur constantly as a major theme in the present book.

Figure 1. The Expansion of Science and of Animal Experimentation
(a) (From Lotka, 1945, Figure 9)



This graph shows the explosive way in which science and technology have grown in recent centuries. Their growth is measured by the simple but ingenious method of counting the number of pages devoted to particular centuries in a book on the history of science and technology. The curve is only drawn to 1900, but the progress of discovery and invention has obviously continued to accelerate since then.

Figure 1.
(b) (From Lane-Petter, 1957a, Figure I)



This graph shows the number of animal experiments performed in the years 1940-56. The figures are taken from the annual returns provided by the Home Office. The units on the ordinate are millions. The curve reflects a steady rise in animal experimentation.

Once this principle is accepted, a host of scientific and technical, or technological, problems are immediately posed. The treatment of experimental animals may be broadly divided into two categories: their treatment when not actually under experiment, which we may call their husbandry in the broadest sense, and their treatment in the course of the experiments themselves. The husbandry of laboratory animals was the first of these categories to be systematically studied, and is treated above all in the *UFAW Handbook on the Care and Management of Laboratory Animals,* now in its second and greatly expanded edition. With husbandry we are, therefore, only incidentally concerned in the present book. "The time now seems ripe for a systematic application of similar principles to the technique of experimentation itself" (Anon., *J. Inst. Biol.,* 1957). And that is what this book is about.

To approach this problem systematically is virtually to create a new discipline of applied science. Now that specializations are multiplying with unheard-of rapidity, the creation of yet a new one may cause many hearts to sink; however this new science has the virtue of being a synthetic one, which brings together under a common viewpoint a vast variety of facts and ideas from a multitude of existing fields. Such synthetic disciplines are likely to be specially fruitful at the present stage of scientific

evolution (Russell, in press, a, b, l and see Chapter 8), and from this one, apart from its immediate or long-term humanitarian fruits, we may expect an important contribution to the progress of the biological sciences at large. There will always be new fields in which the experimenter must improvise, but there are already many which could benefit from systematic monitoring. No really general treatment has, to our knowledge, been attempted of the principles of biological experimentation as such, though some parts of the subject have, of course, been richly studied and reviewed, notably that concerned with the design and analysis of experiments. Part, at least, of biology is now an industry, and in the cybernetic age no industry can afford to dispense with corrective feedback or with the systematic scanning of its techniques.

As indicated in our title, we have made no attempt to begin the cataloguing of special techniques, which could already form the subject of a substantial number of monographs; we have sought only to establish the general principles of this new subject. We hope the present work will serve as an initial source and guide for studies in this field, and also assist those starting, or about to start work, as experimenters on animals, who wish to be as humane as possible to their subjects, and seek an orientation not available, to our knowledge, within the covers of any one book.

We have imposed two restrictions on generality of our treatment. First, in considering the past and present practice of experimental biology, we have confined ourselves largely to the United Kingdom. "No country has higher standards of animal welfare in the laboratory than Great Britain" (Medawar, 1957). In exploring the room for improvement, even here, we are setting the sights high, but this is as it should be. But of course, while Britain is in the forefront when the general standard is considered, we have no doubt much to learn from others in special contexts, as will appear when we consider the possibilities of future improvement.

Second, we have restricted the discussion entirely to the vertebrates, following in this respect the almost fortuitous decision of 1876. The higher invertebrates perhaps deserve a review to themselves, but they raise many problems which would gravely complicate an account which can otherwise be quite general and confident. Only one group, the insects, are of any numerical consequence in practice; the number of cephalopods used alive for experiment is small, though growing. Many experiments on insects are concerned with the development of substances that can be used to kill them, since the economic status of many insects as pests is urgent. Until a fully humane poison is developed for the actual *control* of rats, it is plainly premature to devote much thought to the *research* aspects of insecticides. The privileged status of vertebrates may appear arbitrary when compare, say, lamprey with octopus; but for simplicity and clarity, we shall stick to the traditional division, which has much to recommend it.

Our discussion falls naturally into sections. We shall begin with the concept of inhumanity and its relation to those of pain and distress; this provides a springboard for the evaluation of methods for assessing it. We then proceed to develop a picture of animal experimentation in this country. The need for making such a map as accurate as possible in sheer scale will appear in the following chapter, where the general principles are applied to this background. The first stage of analysis thus deals with the problem of inhumanity and its distribution.

We then turn to the positive aspect--the analysis of methods of diminishing inhumanity in experimentation. These methods fall under three main headings, whose discussion occupies a large part of the book.

Finally, we must spare at least a glance at the more important factors governing the progress of humane technique in its three streams. This problem is bound up with that of the factors governing the general advance of science and technology. We cannot, therefore, do more here than pick up a few trails for others to follow and on the fringe of this rich country we shall bring our exploration to a close.

[1]Throughout this book, the word 'humanity' is used in its secondary sense of 'humaneness' (See Chapter 2).