VALUE JUDGMENTS IN SCIENCE

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1. Introduction:

This note aims to consider the various ways in which value judgments arise and apply within the conduct of science. It is not directly concerned with the value of science to society.

It is often thought that 'value' is not any part of science and that it is society that places value on the results of science and that the scientists involved are free of any responsibility for the uses to which the scientific results are put. However, scientists are human and are part of the society in which they live and work so they can indeed, as such, make value judgments on the topics of work they pursue and, maybe, influence the applications to which it is put. A feeling of moral responsibility for the consequences of their work was indeed felt by the scientists involved in the Manhattan Project, notably Oppenheimer, in relation to the dropping of the atom bombs on Hiroshima and Nagasaki.

I shall argue that there is a wide range of value judgments that come into the pursuit of science: some basic and philosophical, others more personal and practical.

2. Definitions

Let us start by trying to define what I mean by the basic terms 'value' and 'science':

Value: a positive benefit or advantage resulting from some thought or action. This may be purely to oneself, as for example, a clarification of thinking or answering a question or problem presented by others. Or it may be a value or benefit to the group or for the group (or the organization) in which one is involved. (While it is true that 'value' could be positive or negative it is normally thought of and pursued as a positive).

Science: the understanding of the structure and operation of the natural world. The pursuit of scientific understanding involves the establishment of sound theoretical and/or experimental evidence and the limits within which this can be expected to apply. Scientific information is reliable and is reproducible by others and so may be used with justified confidence. Science is involved in many areas of activity from academic research to its application in, for instance, medicine and commercial engineering. Science may be thought of as the 'information' whereas 'the scientific method' is the way in which that information is achieved, made reliable and is presented to the world.

3. Basic philosophic features

A basic philosophic feature of science is that any proposition must withstand the test of experiment and the inspection by others before it can be considered as true and reliable and of real value. Hence the great importance of devising and designing experiments that will reliably test a proposition. In the interpretation of results, and hence in the design of the experiment, it is important to avoid any risk of confusing 'correlation' with 'causation'. An observed feature may vary with a particular parameter, but may not be caused by it – there may be other subtle cross-linking interactions going on. The 'falsifiability' approach, promoted by Karl Popper, is important. Can you show that your proposition is wrong? It may be wrong, or just wrong in certain conditions or situations that limit the applicability of the proposition. This is very important to establish, particularly for developments and applications where operational failures may have serious consequences.

The image of the pursuit of science is that you start with a theory or proposition, carry out experimental measurements and interpret and write up the results. Rarely is it so simple and direct! More usually modifications of the equipment, approach and manner of interpreting results are required as a result of initial observations. Then there is the stage of presenting the results to the critical scrutiny of others and then perhaps reappraisal of the work that has been done. Care

needs to be exercised in rejecting observations that appear anomalous – they may include hidden treasures, or not!

The results of scientific activity are always of value when communicated to other scientists. They may also have value for practical applications.

4. Practical science

In practice most science is pursued with funding either from an external source or from internal sources within a company or organization. Rarely these days is it pursued by individuals using their own funds purely for their own interest and without prospect of future financial or status benefit. Thus, usually the funds to support the work have to be sought with a proposal and quotation (written and/or oral) as to the reason for the study and what benefits are expected to arise from the likely costs. This involves value judgments – identifying the expected 'value', financial or status benefit, to the source of funds – or to society if the funding is to be from a Government of philanthropic source. This value judgment may colour the conduct of the project because there will be a feeling that the end result should match the outcome proposed. With this in mind it is often advantageous to propose a small initial study to demonstrate feasibility or plausibility of the activity proposed, and which can, if successful, be followed by more ambitious and beneficial stages of work (sprat to catch a mackerel!).

In practical science it is important to know when the work done is sufficient. Have you defined with adequate confidence the area in which the results can be applied?

Any risk assessment involves a judgment of values. This is likely to include financial implications and the impact on related systems. Where this concerns health and public safety then the judgment also involves societal values. This is, of course, particularly true in the field of medicine, the handling of hazardous materials and in aeronautical work. In such situations the 'value' judgment may need to take include recognition of emotional impact.

In academia and research institute work there are pressures to publish to enhance personal status within the organization and the status of the organization. In part this relies upon interaction with other scientists working in other organizations. The image able to be presented to Government bodies and to the media may also be of significant value. In commercial organisations publication may be restricted or, if allowed (or encouraged), may need to reflect commercial interests. These are all judgments of value. There is concern, particularly with drug companies, that publicly available information only shows positive results, while problems and limitations may be hidden from view.

5. Conclusion

There are a variety of ways in which judgment of value is involved in, and required in, the pursuit of science.