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ARE WE GETTING THROUGH? THE PSYCHOLOGICAL BASIS OF SCIENTIFIC COMMUNICATION

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ABSTRACT

It is argued that a full understanding of why scientific knowledge is not more widely integrated into popular culture must draw on several levels of explanation. Within the psychological level, several different concepts may be useful in helping us to comprehend the barriers to public acceptance of such information. These include the mechanisms of social representation and social identity, the operation of schemas and personal memory, and motivational concepts such as self-efficacy and learned helplessness. Applying these concepts may enhance our understanding of public acceptance or rejection of scientific knowledge.

Culture, regrettably, is largely a non-scientific affair. As we are aware, for the most part, scientific knowledge makes little impact on culture, and scientists who have something meaningful to say often have to struggle to be heard – with limited success. As far as the general public are concerned, technical and scientific knowledge is seen as divorced from everyday reality. Such knowledge is in the hands of experts, and not for ordinary people. Styles of everyday thinking, lay belief systems, and day-to-day social practices have little to do with scientific knowledge – or with scientific methods.

Part of the problem, it's true, has been to do with how effectively scientists and technologists communicate. The recent awareness that we must go beyond our own disciplines, and learn to talk about our work in a language which can be understood by non-scientists is an important development, and a necessary one. But it is not the whole story. We also need to become very much more aware of how ideas do become integrated into cultural knowledge: of the mechanisms which lead to concepts becoming adopted and widely known.

Effective adoption of scientific knowledge does happen in some areas. Look, for instance, at public awareness of computer games, car technology, new drugs, Exocet missiles. There are also many theoretical ideas from the early part of this century which have become part of everyday culture: psychoanalytic concepts, personality traits, atomic theory, the concept of IQ. Clearly there is no intrinsic barrier to scientific and technological ideas getting through to popular culture: it is possible for it to do so.

Yet for the most part, scientific ideas and scientific ways of thinking are not a common part of popular culture. Superstitions and mystical beliefs predominate; discussions about social issues such as crime or the upbringing of young people remain uninformed by scientific research, or draw from theories long outdated; important, and even essential scientific information is entirely ignored, as we have seen in the repeated calls for mass programmes of AIDS screening, despite clear scientific evidence that this is impossible.

Organising our communications more effectively is of course part of the answer. But it is not the whole story. One of my own research research projects is directly concerned with popular knowledge of ecological issues. Among other activities, I have been asking members of the general public – people who have had little contact with the educational world – to answer straightforward questions such as "what is global warming?", or "what are the likely consequences of cutting down the world's rainforests?". The idea of this research is to discover what people actually do know, as opposed to assessing their attitudes or opinions.

The results reveal a widespread lack of basic knowledge about mainstream ecological concepts. And this occurs despite a massive coverage of ecological topics and issues throughout the mass media; educational programmes in schools, and a high level of public concern. Even though the assessment system which was being used was extremely positive, allowing for the existence of differing opinions and debate around many of the questions, the majority of people were unable to give answers which even approximated to being correct.

Obviously, then, there is more to integrating scientific ideas into popular culture than simply stating them clearly. Ecological concerns have been stated very clearly, and on several occasions, often by people who are highly skilled communicators.

But communication is not a one-way process: information can be transmitted, but it also has to be received. It's one thing putting out ideas, but it's another thing getting accurate versions of those ideas to permeate generally-accepted day-to-day knowledge. We need to develop an effective understanding of how human beings receive, and act on, meaningful information, if we are to be able to disseminate information effectively. And it is in this area that psychology has something to contribute.

Like any other social issue, understanding the integration, or otherwise, of scientific knowledge into general cultural awareness doesn't lend itself to simplistic analyses. No one discipline can give all of the answers to what is involved. Such questions need to be addressed using multiple levels of explanation. The question of how information becomes adopted or ignored by the general population needs to be understood in its many contexts: neither knowledge, nor effective social practices, occur in a vacuum.

The question has philosophical dimensions, concerned with the deeper perspectives underlying cultural assumptions, which orient a society towards recurrent themes like social progress, individual achievement, or Cartesian dualism. It has politico-economic dimensions, concerned with the interests of different groups in society, perceived economic and practical consequences of action, and baseline questions about profit and choice. There are also sociological dimensions, concerned with such issues as ideological structures, power relationships, and cultural impetus for change. And there are psychological dimensions, concerned with how individuals receive and respond to information, their motivation and their personal belief structures.

All of these are interknitted. Obviously, as a psychologist, my main area of interest is in the psychological dimension. But this is just one level: other scientists and social scientists are concerned with what is going on at other levels. Each of these levels of explanation informs the others: I am not in the business of trying to claim that the psychological level is in any way better, or more important than any of the others. They are all important, if we are to engage in effective social action. But as a psychologist, it is the psychological dimension that I am best able to articulate.

Within psychological levels of explanation, there are a number of different conceptual tools on which we can draw, when we are looking at the question of how to integrate scientific knowledge into culture. These conceptual tools are directly useful, because they can give us insights into how and why ideas will be accepted or rejected. Like the philosophical, politico-economic and sociological dimensions mentioned above, they tell us something very fundamental about what is going on when people are exposed to information.

Social representations and social identity

Like other disciplines, psychology itself spans several levels of explanation. One of its theoretical areas is directly concerned with the interface between ideology and individual cognitions – with the social representations, or shared beliefs, held by groups in society. This area was first opened up by the French psychologist Serge Moscovici, who described how social representations consist of a central nucleus, which is often ideological in nature and tends to remain pretty consistent. There are also a number of peripheral elements, which change depending on new information, circumstances, etc. The central core links with deeply-rooted cultural and philosophical perspectives to do with perceptions of human nature and the world.

Moscovici also stressed that people do not simply accept the predominant social representations passively. They are negotiated and adjusted, through conversation, selective media perception, personal constructs, etc., until they can be fitted into the individual's own private belief system. It is as a result of this negotiation that social representations change gradually, over time, and come to be able to absorb new information.

Among his other research, Moscovici looked at how scientific knowledge becomes incorporated into generally accepted social representations. In 1961, he charted how psychoanalytic theory had moved from the status of a scientific theory, to a generally accepted set of cultural beliefs – and how it had become transformed in the process. In 1983, he and Miles Hewstone reported how split-brain research had entered popular culture, and how in the process it had become transformed into a popularised version which was used in ideological fashion, to "explain" the nature of modern society.

Moscovici and Hewstone identified a number of mechanisms in this process. One of these was personalisation, in which a particular scientific theory becomes associated with a named individual, in the way that relativity, for example, became indelibly associated with Einstein in the public mind. Another was concretisation, in which scientific ideas are made more manageable through the use of concrete metaphors – like the popular model of atoms as billiard balls. Moscovici and Hewstone were charting a social process which had ultimately led to a powerful ideological distortion of the original scientific knowledge. However, their research has some useful messages for us in terms of the way that information becomes integrated into popular culture.

Another central theory in the school of thought which has become known as European social psychology, and one which is often closely linked with social representation theory, is that of social identification. It seems to be a fundamental human tendency to divide the world into "us" and "them" – to see society and social life as consisting of in-groups and out-groups. Identification with these groups is more than the adoption of a social role – it permeates the individual's own self-concept, and becomes a significant part of how we see ourselves.

Social groups differ systematically in power and status, which has implications for the nature of group identification. It also has implications for the nature of explanations shared by group members, which is where the link with social representations comes in. Intergroup conflicts can arise between different groups, but they are not necessarily inevitable. When they do come up, however, social identification becomes strengthened, and can determine entirely what forms of information are accepted or listened to, and which are rejected.

Research into social identity has a great deal to tell us about the mechanisms by which this takes place, and the circumstances under which intergroup conflicts are likely to occur. By understanding these mechanisms, we are in a position to perceive why it is that some forms of information become associated with certain groups and rejected by others – for instance, why it is that some groups in society consciously reject or systematically disparage "scientists" and their ways of thinking about things.

Social scripts

At an interpersonal level, we come across aspects of psychological theory which can tell us more about the ways that people understand social action and social processes. Some forms of social action are more likely to occur than others, because they have been pre-scripted, and form familiar patterns of social behaviour. To understand how this works, we can draw parallels with linguistic relativity and symbolic interactionism.

We are familiar, for example, with the way that particular vocabularies can shape and structure how we think about social issues: they may not determine what it is possible for us to think, but they make it much more likely that we will think in one way rather than another. Similarly, we are familiar with the concept of social role, and how the enacting of roles shapes our social behaviour. It may not determine entirely how we act, but playing a role makes it much more likely that we will act in a certain way rather than another.

But we are much less familiar with the equally important idea of social scripts, and how these, too, shape our social action. Everyday life is full of scripts: from the pre-scripted sequence involved in going to a restaurant, to the events that we expect to happen when a couple decides to get married. We are surrounded by social scripts of one form or another: interpersonal scenarios are acted out in song, drama, television, film and newspaper report, as well as transmitted in individual interaction. And, as with vocabulary and social role, it is far easier to act in accordance with the script than to act independently of it, even though independent action remains possible.

To take one example: relationship breakdown is a highly scripted event. There is a multiplicity of songs, dramas, films, and TV shows which enact breakdown scenarios. But very few of these encompass the idea that a relationship may end yet the couple may remain as close friends. After all, it isn't a particularly exciting story, and doesn't give anyone much to sing about. Accounts of dramatic betrayal, abandonment, or dispute are much more common.

There are, however, couples who do end their relationships yet remain as close friends. That possibility of social action is not precluded, simply because the social scripts are not commonly represented. But a couple who wishes to pursue that route needs to engage in an arduous process of social definition and negotiation,

which is moderately difficult, and sometimes fails. A couple who simply re-enacts one of the pre-scripted scenarios, on the other hand, are engaging in a pattern of activity which is familiar, and in which the appropriate actions and expectations are well worked out. Their course of action is much more straightforward and better understood.

In other words, social scripts outline possibilities of social action, and provide us with mutually comprehensible ways of conducting our lives. Some scripts are relatively unproblematic: the script of what goes on when we go to a restaurant doesn't give us much difficulty. But if we are to integrate scientific ideas into popular culture, we also need to look at, and generate, plausible scripts whereby undertaking scientifically relevant action can be perceived as part of our everyday possibilities. For the most part, scientific knowledge and its application is seen as irrelevant, and not really a part of everyday living as well.

This applies to scientific ideas, as well as to scientific role-models. There is a great deal of research into the mechanisms of co-operation and reconciliation, for example, but these are not reflected in the social scripts apparent in the mass media. There is research into the different dimensions of positive emotions, yet these too are rarely reflected. By defining certain social scripts and not others, we only explore a limited range of possibilities for action, and make it harder for people to conceptualise alternatives as realistic and practical. By using the idea of the social script as a conceptual tool, we are better placed to understand another facet of the effective integration of scientific knowledge into everyday culture.

Schemas and personal memory

Social scripts are particular types of cognitive schemas – ways of organising our information about the world, in such as way as to enable us to plan effective action. Each of us acts in our world on the basis of our understandings of how that world works, and there are several psychological mechanisms which are concerned with how these understandings develop, and how they are applied in everyday living.

Schemas influence what information we are likely to detect, as well as how we are likely to respond to that information. Ulrich Neisser presented the essence of

cognition as a continuous perceptual cycle, in which we pick up information from the environment on the basis of a perceptual search, which in turn is directed by anticipatory schemas. These schemas, in their turn, are modified by the information that we pick up. So while we can become aware of unanticipated information, we are more likely to become aware of it if it is anticipated.

But that doesn't mean that what we actually perceive or remember will be an exact copy of the information that we were given. As early as 1932, Bartlett showed how we adjust, and even distort information, in order to fit it into our personal schemas. Information which is too incongruent is ignored; information which is highly congruent is assimilated, but most information is adopted in a modified or adjusted form. It is this process which forms the basis from which social representations are negotiated by the individual, and which channels and directs our actions. It is also this type of cognitive framework which allows us, unconsciously, to fail to notice information which is not congruent with what we already know.

Schema theory also ties in with the process of making attributions. People act on the basis of the sense they make out of what is going on, and part of that sense involves ascribing reasons for why things have happened. By looking at the kinds of attributions which people make, we can identify systematic variations, which may help us to understand cultural variations in style of thinking, and why some groups may be more prepared to accept certain types of explanations than others.

This approach can also be linked back to social representation theory. The methodological focus of the Moscovici and Hewstone study, for instance, emphasised how the formation of certain types of social representation led to particular kinds of attributions – to do with why the world is like it is and how it has come to be that way. These attributions then serve an ideological function, legitimising approaches to, and forms of awareness of, social action. In this way, we can identify links between intrapersonal and socio-political levels of explanation, which can help us to understand more about what actually happens to information which is released into society in general.

Learned helplessness and self-efficacy

More specific research into attributions leads us into questions about personal motivation. Some people are demonstrably more likely to adopt attributional styles which characteristically involve attributions which are internal and controllable. These people contrue what happens to them as originating from their own personal abilities or efforts, and as amenable to control. Such people are more likely to take a positive, agentic stance towards events in their lives. They are also more likely to respond to information which is congruent with such a stance, and to make active choices with respect to adopting new approaches and knowledge.

This links with the question of self-efficacy beliefs: if we believe that we can be effective, and competent, we put far more effort into our actions than if we do not perceive ourselves as likely to have an effect. Both children and adults are more likely to persist in the face of failure, and to achieve higher levels of eventual success, if they have high self-efficacy beliefs. Those whose levels of self-efficacy is low make fewer attempts to improve their situations, and give up more easily.

It is a well-established finding in psychology that if either people or animals are faced with situations in which nothing they do will have an effect, after a while they stop trying to do anything. Moreover, that passivity remains long after the situation has changed: it is known as learned helplessness. Wthout a sense of personal agency, there is no motivation to do anything other than remain passive in the face of social change.

Understanding the attributions which people make and the self-efficacy beliefs that they hold, therefore, can also help us to understand why they may be more or less likely to receive and respond to certain kinds of information – and also, why they may be more or less likely to put the implications of that information into practice.

If we are attempting to communicate information in such a way as to induce global responses to technological and scientific change, we need to bear these messages in mind. Flooding people with doom and gloom messages, which provide no opportunity for the exercise of personal agency, can only induce learned helplessness and apathy. Showing people how their efforts can produce effects is likely to enhance their self-efficacy beliefs, and encourage their receptivity to future information.

We can see this very clearly when we look at people's responses to environmental issues. In my own research, the only area of environmental knowledge which was clearly well-understood was that of the thinning of the ozone layer. It is also the only area of ecological concern which has produced a specific, clearly targetted and personal route for action among the general population. The rapidity with which CFC-based aerosols disappeared from supermarket shelves once the information about their effects became widely known was striking – and indicates that the public is far from apathetic on these issues.

But this was a specific issue, which could be targetted very clearly. Most other ecological recommendations are global in nature – "reduce energy consumption", "avoid unnecessary packaging". Moreover, too often they are systematically undermined by puritanical demands for major changes in lifestyle, which perceived by many as impractical and unrealistic. As a direct outcome of their global nature, they generate feelings of learned helplessness, and consequent apathy.

There is a question about how we go about communicating with the public, too. All too often, it is assumed that the general public is essentially stupid, and unable to grasp more than one idea at a time. Yet repeatedly we find that this is not so. The general public is able to deal with highly complex information, if it is motivated to do so. It is, however, sceptical: the mass of contradictory information with which it is faced in any given day means that expert knowledge is treated with some degree of cynicism.

Part of this problem arises from the scientific communicator's tendency to present the general public with overly simplistic explanations. Making one's response to a question easy to understand does not have to involve distorting the actual ideas. It is perfectly possible to describe levels of explanation in everyday language. Moreover, focusing on one level, as if that were the only answer invites rejection, since it is too easy to show how any one level of explanation is insufficient. Part of communicating effectively, I suspect, includes educating the public to accept that problems are multi-faceted, not assuming that it is too stupid to understand.

We can see, then, that the level of scientific explanation which we know as psychology has a great deal to tell us about how, and under what circumstances,

people are likely to be receptive to and to act on scientific information. It doesn't tell us the whole story, of course. As I said at the beginning of this paper, psychology is only one out of several levels of explanation which we need to address if we are to understand the relationship between science and culture. However, psychology is a level which has often been ignored, perhaps because of its relatively impoverished history. Certainly, the psychology of thirty years ago was very different, and much less applicable to this problem, than the psychological knowledge of today. The theories and approaches of modern psychology, in my view, can provide us with some useful insights into this question, even though they can't give us all the answers.