

Some Approaches to the Problem of Potentisation

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It is as certain as any inductive observation can be, thus in practical terms quite certain, that homoeopathic potencies of particular natural substances do carry specific activities, which are manifested in particular therapeutic effects following correct prescription. This holds good for the thirtieth centesimal, the most widely used potency in ordinary homoeopathic prescribing in this country and indeed for vastly higher potencies. Hence arises the well-known paradox that we are getting clinical results, ultimately expressed in physiological changes, by administering preparations which could not contain even a single molecule of the material prescribed.

This paradox deeply concerns not only medicine but also basic science. Can the facts be accommodated at all within current scientific concepts? If not, how can we conceive the activity inherent in these preparations; what manner of extension of scientific thinking is called for by the fact of organic response to the evidently non-material activities?

We can go at least a little way within the concepts of current science and I want to try and explore how some of them might be involved.

Those who have, from Greek times onwards, speculated about the constitution of matter have either regarded it as a continuum, in principle infinitely divisible without loss of character, or as an assemblage of particles. Since the quantification of chemical composition in terms of combining, subsequently 'atomic', weights and the abandonment of the four-element notion, around the end of the eighteenth century, the particulate view of matter has been dominant, especially as a mental picture. It was still regarded by some eminent scientists as a useful imaginative and working model, but not a statement of reality, as late as 1906 when Einstein's paper on Brownian movement converted those who had still been sceptical about the physical reality of atom and molecule.

Thermodynamic thinking has however carried on in an abstract way something more like a view of matter as effectively a continuum; the effective presence of a substance in a physical system is considered for thermodynamic calculation not in terms of molecular concentration, but in terms of some 'potential' such as fugacity. It is therefore to thermodynamics that we may look for a hint as to how we should understand in scientific terms what happens when a substance is dispersed, by some means such as diluting a solution of it, beyond the Avogadro point.

Lewis and Randall's textbook Thermo dynamics contains a passage which is of special interest in this connection (1):

"Figures are sometimes obtained which are so small as to seem ridiculous ... and yet ... have as definite a significance as others which are capable of direct measurement.

Thus ... if 0.04 mole of silver cyanide are dissolved in 1 litre of 3M potassium cyanide ... the number of active molecules of silver ion is about ... 1/10 per cc. How ... can one

say that ... there is any concentration of silver ion at all? We simply mean that ... at any one instant ... the chance of there being one molecule in any given cc is 1 in 10.

... if a suitable catalyser is placed in saturated water vapour ... at 25°C, the partial pressure of hydrogen is 250×10^{-28} atmospheres, which is equivalent to the pressure exerted by a single molecule in ... about one million litres. Yet this value has a precise significance and is certainly known within a few percent.

... if we calculate the vapour pressure of tungsten at 100°C ... the result, 10^{-105} atmospheres, would mean that the concentration of tungsten vapour would be less than one molecule in a space equivalent to the known sidereal universe ... we may utilise such a calculated vapour pressure in our thermodynamic work with the same sense of security as we use the vapour pressure of water."

The point is that a thermodynamic potential function, which can only be pictured in molecular terms as a probability, remains a valid quantitative statement of the effective presence of a substance in circumstances where there is no tangible material concentration in molecular terms. The potential function is in some way a reality. If we apply somewhat similar thinking to the high potency dilution, we may say that there is still a presence of the substance, although it cannot be thought of as a molecular presence; in molecular terms it has taken the form of a probability.

To put it very crudely, the molecules which are pictured as having been present in the original solution must have gone somewhere, but could have gone anywhere, in the dilution. If we picture a stage where there are n molecules per ml, and $n < 100$ and disperse 1ml of such a solution in a volume of 100 ml of medium, any 1 ml sample of this further dilution may or may not contain one, or possibly a few more, molecules of solute but the probability of a molecular presence is the same for all samples and this is all that can in practice be said about their content of the substance.

In ordinary ranges of concentration we may think of the presence of the solute in terms of molecular concentration. As dilution progresses it becomes increasingly impossible to think in this way because once we reach a level where the number of molecules is not overwhelmingly large, we can no longer consider their distribution in different samples of a dilution to be effectively uniform. Our notion of the presence of the solute has gradually to take the form of a probability. What changes, as we go from 10^{-10} to 10^{-20} and on to 10^{-60} (C 30) and further, is not essentially the real nature of the solute presence but the way we have to think of it, so long as our minds are operating in terms of the kinetic-molecular picture.

The situation is not precisely analogous to those indicated by Lewis & Randall, where a time element can be brought in. When they picture even the highly attenuated presence of tungsten vapour in an atmosphere through the escape of occasional atoms from a metal surface and the return of atoms to it, they could to some extent save the particle picture by regarding their probability function as a time average of the real presence of atoms in the atmosphere about the metal. In the course of a second there could many times have been

for a brief instant a free atom in this atmosphere. We can hardly think of the probability of a molecule in a millilitre sample of a dilution as a time average of intermittent real molecular presences, but even if we forego the picture, the probability, expressed in any convenient terms such as that of one molecule per unit volume, remains a real property or function which is the same for all samples of a dilution.

Thermodynamic potentials, which may be interpreted in probabilistic terms, are found for their own purpose more valid than molecular concentrations at much lower dilutions. As dilution progresses they become the only significant statement. There is no sharp point of switchover. There is at all stages a dual aspect, encountered in physical thought as mass concentration and energy potential (2). At one end of a dilution scale the former seems more real and picturable, while the latter gains in significance as dilution is continued. If the former is interpreted as molecular concentration the latter most readily accepts interpretation as a probability. Potentisation also is no single once-and-for-all development located at a sharp point on the scale of dilution. The property of potency is developed at low dilutions, such as C6 and C3 as well as at high dilutions, though its impact on the organism may be different at different points.

This shift of concept, between the mental picture of molecular concentration and a notion of activity whose formulation accepts a probability interpretation, inevitably reminds us of the metamorphosis which the concept of particle has undergone in physics. Here again the maintenance of a particle picture of the constitution of matter necessitates interpreting formulae in terms of probabilities. Apparently some physicists are content to accept probability formulae as hard final realities while others, like Bohm, try to conceive a deeper immaterial reality behind them. But the present fact seems to be that these apparent probability formulations express the hardest form of physical reality that thought has been able to recognise.

The problems of theoretical physics are vastly beyond our immediate concern but there may be a significant analogy between the duality, the complementarity, of a system of particles conceived mechanically and a continuum which can only be conceived probabilistically, on one hand, and the chemist's duality, between mass concentration and energy potential, on the other. The chemist's potentials represent essentially the active aspect of substances, manifested in physical and chemical interaction, and they apparently remain valid in conditions where the mass, representing the passive or inert aspect, simply disappears. If we consider chemical and associated activities to be already manifestations of cosmic influence, it would not be too far-fetched to consider thermodynamic potentials as being in some sort of continuity with the mode of functional presence of a substance in a medium which can carry the properties of homoeopathic potency, for we should also be considering these properties as cosmic influence. We could perhaps think of them as present in some way at all stages in some latent form.

It is generally believed that mere dilution, attenuation of the material aspect, is not in itself an adequate means of liberating these properties. Steiner certainly taught that the stepwise dilution, with due succussion at each step, was essential, and emphasised the element of rhythm in this procedure.

Paracelsus defined the task of alchemy as the making of medicines out of natural materials. This required the separation and rejection of the gross matter, composed of the four elements of physical existence, and the isolation of a '*quinta essentia*', a specific active principle, which he sometimes referred to as a seed, of cosmic origin, nurtured in the four elements as in a soil. He seems to have thought mainly of distillation as the procedure required. He would for example prepare a metal such as mercury, for medical presentation, by distilling the metal or ore with weak sulphuric acid or other material, and repeatedly redistilling his distillate. Modern scholars have commented that his final preparations could hardly have contained any of the substance they purported to present. We may add that there was of course a certain quantifiable probability of single metal atoms being carried through the operations. Anyhow Paracelsus' reputation as a brilliantly successful physician implies that his preparations were effective.

If we consider the physico-chemical analogies between the dissolved state and the gaseous state, these two procedures of expansion by serial steps reveal a certain affinity. In Paracelsus' routine there was an alternation of expansion in distilling and contraction in the condensation. Hahnemann appears to have set out on his course of serial dilution primarily as a means of reducing the toxicity of his raw materials, but he later came to a sense that his procedure liberated a further activity, which he called the 'conceptual essence'. There is some possibility that his later thinking was influenced by a study of Paracelsus' writings.

We may almost certainly take it that Hahnemannian potentisation depends on the stepwise dilution being accompanied by intense succussion of fluids or trituration of solids. At each step in dilution a small quantity of solution of a certain concentration is actively and rapidly dispersed through a large volume of medium, forming once again a uniform solution. In the absence of shaking such dispersion would take place spontaneously by ordinary diffusion. This process however depends on the difference in concentration between the stronger and the weaker regions of the solution and slows down as the difference decreases, thus approaching the final state of complete uniformity asymptotically. Uniformity of composition for practical purposes may be reached relatively soon, but from a certain abstract point of view it is possible to say that absolute theoretical uniformity is not attainable in finite time. By human and mechanical activity the process of mixing is driven to full completion in perhaps a couple of minutes. Time after time in the operation the spontaneous course of inorganic nature is foreshortened; a potential tendency is driven to complete realisation. I have spoken of this in terms of concentration because this is how we most easily picture it; in fact we are making these forced changes in a potential of activity.

Nature offers us something to compare with the foreshortening of a potentially infinite duration. The growth of a plant stem, giving rise to leaf after leaf, often showing progressive change in form and diminution of area, seems to be intrinsically capable of going on for ever. In flowering that whole implicit future is foreshortened, telescoped into the basis of seed formation. This foreshortening is not an intrinsic necessity of stem growth; under certain cultural conditions, such as over-richness of soil, it may not occur.

There is no existing physical concept for what we do when we force completion in a short finite time of a process which would spontaneously run a slower course and approach

completion asymptotically. There cannot be many situations other than the dilution of a solution where we have the opportunity of this sort of interference.

Potentiation involves a series of forced expansions of solute volumes. The notion that these expansions are driven to a completeness unattainable spontaneously in finite time requires some qualification. In shaking we disperse layers or streams of solution in the diluent and ultimate mixing is still dependent on diffusion, though as shaking progresses the streams of solution are becoming less concentrated and the medium they spread in is already a solution. The finer and fuller the succussion, the more remote the dependence on diffusion becomes.

A dissolved substance diffuses through a volume of solvent under the same laws as a small puff of vapour expands by diffusion to fill the space of the containing chamber. This process could also be forced by stirring. Either process could be accelerated by raising the temperature but the asymptotic character of its approach to completion would not in principle be altered by this. In so far as succussion is able to bring the process of mixing to completion we are doing something we could also do by heating and also pushing it that last bit further.

Physically the mechanical activity of shaking must be dissipated in heat liberation. The entropy of the final uniform solution is higher than that of the starting point of, say, 1 ml of solution placed in 99 ml of medium. Can we conceive of some physical or quasi-physical function attending this transformation of mechanical work into the forcing of a spontaneous process, somewhat in the way that a change of entropy attends it? It would be in a way an opposite or complement to entropy, representing a value for the organisational element in the mechanical work done, which disappears from physical consideration when the energy of mechanical work is converted into thermal energy.

Considered in bulk terms dilution with succussion does not involve the alternating phases of contraction which appear in Paracelsus' operations. There is no means of contracting the volume to which a solute has been expanded short of boiling down the solution or fixing up a system which would selectively withdraw solvent osmotically. We must however note another aspect of the Hahnemannian operation in which contraction does alternate with expansion.

An immense creation, destruction and recreation of surface takes place many times in a minute or two of succussion. The obvious surface is a medium/atmosphere interface in the dilution of fluids; in trituration there is in the grinding together of particles of mineral and medium something more complex, but equally a perpetual creation of fresh interface. Once again we have the theme of expansion, now alternating, or rather interwoven, with contraction, at least in work with fluid media, and the expansion is in a two-dimensional realm.

This may be more relevant than the volume expansion with which it is associated, if we are concerned with influence from the cosmic periphery, where George Adams' geometry has taught us to think of activity as existing in planes rather than centred on points. I remember Dr. Lehrs explaining to me that the entrance of etheric activity into manifestation in the

material realm occurs through surfaces: "People" he said, "try to conceive of adding a fourth space dimension to account for effects beyond the physical, while in fact they ought to subtract a dimension." How else indeed could we think of planar activity operating in bulk matter, except through interfaces? I suspect however that we should not think of static interface in this connection but of nascent interface. This is abundantly present in potentiation and something rather similar is present in active living tissues where the surfaces of cells and cell organelles are ever in a dynamic state of chemical turn-over and rearrangement.

We may tend to think in terms of the action of a remedy. This may be appropriate in ordinary pharmacology but can have no meaning when we are no longer concerned with mechanical events, with the molecular model of processes in nature. The activity of potency must be considered in other terms, even though they too can be no more than the terminology of yet another mental picture.

I suggested recently (3) "that the remedial preparations of homoeopathy clearly cannot be operating through molecular pharmacology. They seem rather to carry 'information' in a manner whose physical basis is at present much discussed. The action seems essentially to be a 'communication', at some level between that of molecule cell interaction and that of verbal and behavioural human interrelation." This was not of course an original idea; it was prompted by much that has been said and written by other people, particularly by Dr. Twentyman.

This sort of conception, or terminology, seems more valid in the realm of the living and can bring us to some sort of meeting with another line of scientific thinking. In immunology and genetics such terms as 'message' are now normal currency. They came in as more or less metaphorical importations from the use of the 'information' concept in communications engineering but are developing a validity of their own.

If we were to put our thought into this sort of form, we should find ourselves considering how we can conceive of a potency as a vehicle of a specific message, which the organism is attuned to receive when in a particular condition of disturbance.

The specificity of the message evidently derives from the nature of the material potentiated. I have spoken hitherto rather as if considering solutions of simple substances. Most often in the preparations of remedies a natural material is used. From a chemical point of view this would be a complex mixture of molecular species, so that we should recognise its presence in the dilution to consist not in a single potential function but in a vast number of such functions, a difference rather like that between mono chromatic light and the spectrum of a colour of nature.

This complexity of composition might touch a central problem of biology which is focussed in the term 'organisation'. Some, like Monod, consider that the intimate structure of cells and the control of their processes arises in protoplasm as a spontaneous consequence of the chemical relationships of the substances associated together. Others would feel that organisation has to be thought of as a prior directive principle whose nature remains inconceivable. Either way its effective existence is maintained within the basic chemical

composition. Can it remain within this material when the structures to which it has given rise have been destroyed through processes of extraction and potentiation? In a way it is just an extension of Monod's picture to suppose that it is still implicitly present in the spectrum of functional potentials which is all that is left of the material after potentiation, though it is a long extension and made with a different implication. Paracelsus might well have said that the cosmic seed is not necessarily annihilated by the disturbance and destruction of the soil.

I have suggested that the extra-terrestrial element of substance is already present in the thermodynamic potentials, or rather in the activity which they express, for as formulae they are simply the means of calculating the effects of this activity in physical systems. We might try considering a continuity between what is expressed in these potentials and what, through the course of potentiation, becomes the carrier of a specific message, determined by the particular nature of the substance or mixture, the composition of the mixture or the organisation implicit in it.

The message must at all times be somehow implicit in the material. Through potentiation it becomes somehow activated or amplified and communicable. This effectively seems to depend on the processes of forced expansion in volume and expansion of surface, which have energetic as well as mechanical aspects. Can we really form any positive notion of what goes on in these processes?

I can only think again of Paracelsus' analogy - with the seed, and of the process of germination which follows the entry of moisture. We think of this as an alteration of the seed's connection with the cosmos, as the realisation of this connection in form-creating terms, developing in earth existence living forms which continue in active interchange with the cosmos. The seed selects, as it were, its own formative determination out of a whole range of influence which is everywhere potentially active. The plant form, which it thus develops, is itself a 'message' which we aspire to read with sensitivity and understanding. Can we properly conceive of the operations of potentiation as something analogous, as developing in the functional traces of the material, the 'seed of its physico-chemical activities, the particular, as it were 'selected', message which the organism may read vitally?

References and Notes:

- 1) Lewis, G.N. and Randall, M., Thermodynamics, 2nd Ed., revised by Pfizer and Brewel (McGraw Hill, 1961), pp 92-93.
- 2) Lewis and Randall speak of the mole as the capacity aspect and the molar free energy (redefined for numerical convenience as the 'fugacity') as the potential aspect of the substance.
- 3) Morris Owen, R.M., Lancet, 1980 (2), p.698.

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