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SOME THOUGHTS ON THE WORK OF THE WÜRZBURG SCHOOL AND THE CONTROVERSY IT PROVOKED, PROMPTED BY A VISIT TO WÜRZBURG 10-16 OCTOBER 1989.

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The Würzburg-Titchener controversy

During the first decade of this century, a group of psychologists at the University of Würzburg under the leadership of Oswald Külpe defied an edict by the founder of experimental psychology, Wilhelm Wundt, which denied the possibility of applying the method of experimentally controlled introspection to the study of the higher mental processes. Not only did they undertake an experimental introspective investigation of the process of thought, they scandalized the psychological establishment of the day by claiming to have discovered states of consciousness in which sensations, images and sub-vocal speech played no part. These experiments and the controversy they provoked constitute what is, arguably, the most important single event in the history of Psychology as an independent scientific discipline, since Wundt's foundation of the first psychological laboratory at Leipzig in 1879.

On a visit to Würzburg in October 1989, I called at the present *Psychologisches Institut* of the University of Würzburg and spoke to Birgit Blottner who was then engaged in research on the surviving correspondence and other unpublished documents from that period. This visit prompted me to set down these reflections on the work of the group and the controversy it provoked, particularly the controversy with Edward Bradford Titchener. Titchener, as you may know, was an Englishman who, after studying Philosophy and Physiology at Oxford, took his doctorate, along with Külpe, in Wundt's laboratory at Leipzig. He then migrated to the United States where, as Professor of Psychology at Cornell University, he became the self-appointed champion of Wundtian orthodoxy in that country.

It is often supposed (e.g. by Humphrey 1951) that the controversy between Titchener and the Würzburg School was over the existence or non-existence of imageless thoughts which was asserted by the Würzburgers and denied by Titchener. In fact Titchener did not deny the existence of imageless thoughts. In his *Lectures on the Experimental Psychology of the Thought Processes* (Titchener 1909) he discusses a number of cases of mental events, such as recognising something, understanding an utterance or switching from one language or code to another in the course of conversation, which are achieved, as he puts it, "in this purely physiological way" without any accompanying sensation or image in which the mental event in question might be supposed to consist. The key passage in which he makes this concession reads as follows:

As a matter of fact, meaning is carried by all sorts of sensational and imaginal processes. Mental constitution is widely varied, and the meaning-response of a mind of a certain constitution varies widely under varying circumstances. A descriptive psychology is primarily concerned with types and uniformities; but if we were to make serious work of a differential psychology of meaning, we should probably find that, in the multitudinous variety of situations and contexts, any mental process may possibly be the meaning of any other.

But I go farther. I doubt if meaning need necessarily be conscious at all, - if it may not be 'carried' in purely physiological terms. In rapid reading, the skimming of pages in quick succession; in the rendering of a musical composition; in shifting from one language to another as you turn to your right or left hand neighbour at a dinner table: in these and similar cases I doubt if meaning has any kind of conscious representation. It very well may; but I doubt if it necessarily does. There must be an *Aufgabe*, truly, but then the *Aufgabe*, as we have seen, need not either come to consciousness. I

was greatly astonished to observe, some years ago, that the recognition of shades of grey might be effected, so far as my introspection went, in this purely physiological way. I am keenly alive to the importance of organic sensations and, as I shall show in a moment, to that of reduced or schematic kinaesthetic attitudes. I was not at all astonished to observe that the recognition of a grey might consist in a quiver of the stomach. But there were instances in which the grey was 'recognised' without words; without organic sensations, kinaesthetic or other; without the arousal of a mood; without anything of an appreciably conscious sort. I cannot further describe the experience: it was a simply a 'recognition' without consciousness. (E. B. Titchener, *Lectures on the Experimental Psychology of the Thought Processes*, 1909, pp. 178-9)

It is clear from this quotation that what Titchener was objecting to was not the notion that thoughts and other mental events might occur without any accompanying sensation or image; he concedes that they frequently do. What he was objecting to was the use which was made by the Würzburgers in this connection of the expression *Bewusstseinslage* or "conscious attitude"¹. Titchener objected to this term because for him

- (1) consciousness was essentially a process², i.e., a continuous sequence of changes spread out over time, whereas a *Lage* or attitude is a state which, in so far as it is spread out over time, remains unchanged; it follows that on Titchener's usage the expression 'a conscious state or attitude' is a contradiction in terms³;
- (2) consciousness is essentially an awareness of raw uninterpreted *qualia*, to use the modern philosophical term, or "raw feels", as Tolman (1932 pp. 214-5) calls them, whereas *Bewusstseinslage*, as is clear from the way the Würzburgers used the term, are meanings; and meanings for Titchener, when he is speaking carefully, are "carried" by conscious contents (sensations, images, etc.), but are not in themselves part of consciousness (*Bewusstsein*) or, indeed, part of the data of experimental psychology⁴.
- (3) introspection (Wundt's *Selbstbeobachtung*) is essentially a method in which a trained psychological observer strips away meaning from his or her experience in order to get down to the raw uninterpreted *qualia* underneath⁵, from which it follows that a procedure like that used by the Würzburgers which ends up with reports of meaning is not genuine introspection as understood by Titchener.

***Selbstbeobachtung* and the problem of stimulus error**

It appears from this that the issue between Titchener and the Würzburgers is really an issue about terminology, about the meaning to be attached to what had become technical terms in the new science of Psychology, terms like *Erfahrung*, *Wahrnehmung*, *Bewusstsein* and *Selbstbeobachtung*. The controversy can be resolved, I suggest, if we recognise that there are two different ways in which we acquire mental self-knowledge, each of which gives access to a different aspect of our mental life. The first of these is the process which Wundt called *Selbstbeobachtung* and which Titchener translates as "introspection". We need to recognise, however, that the programme advocated by Wundt and Titchener whereby the trained introspective observer is supposed to strip away "stimulus meaning" (i.e., what he knows about the stimuli

¹ The introduction of this term by Marbe and the problem of its English translation is discussed by Humphrey (1951) in Chapter II, footnote 5, pp. 33-4.

² See his *An Outline of Psychology* (Titchener 1896/1901, pp.6-15).

³ It is true that in the passage quoted he speaks of "reduced or schematic kinaesthetic attitudes"; but the term "kinaesthetic" is enough to show that what he has in mind is some kind of on-going sensation.

⁴ See Titchener (1909 pp. 25-7). A less consistent account of the same issue is given on pp. 174 ff. from which the above quotation is taken. This quotation illustrates Titchener's idiosyncratic use of the terms "conscious" and "consciousness" which leads him to talk of "a 'recognition' without consciousness", without realising that it is his use of "consciousness", not the word "recognition" that deserves the scare-quotes. That it is his use of the terms 'conscious' and 'consciousness' that is deviant, appears when we notice that he would not deny that he was conscious *that* he had recognised the grey in question.

⁵ See Titchener (1901, pp. xxvi ff.) and (1909-1910, pp.202 ff.)

which typically produce experiences of that kind) in order to get down to raw uninterpreted *qualia* underneath is a piece of nonsense.

I stated the argument which convinces me that the Wundt-Titchener programme for eliminating what they called "stimulus error" is an unattainable absurdity in a paper entitled 'Twenty years on - is consciousness still a brain process?' (Place 1977) as follows:

It now turns out in the light of Wittgenstein's private language argument that we cannot put into words what we know about our own private experience in such a way that what we say can be understood by another person *without* presupposing a whole body of knowledge on the part of both the speaker and his audience about the present and past states of the three-dimensionally extended public environment which is common to both of them and about the correlations between the states of that common environment and the private experiences of both speaker and audience. For if we consider what would be involved in putting into words what we know about our own private experience, without presupposing any knowledge about the present and past states of the external world and about the relationship between these states of the public world and our private experience, we are confronted with the situation which Wittgenstein envisages in section 243 of the *Investigations* in which we try to construct a language such that 'the individual words of this language are to refer to what can only be known to the person speaking; to his immediate experience. So another person cannot understand the language.' (Place 1977, p. 8)

We cannot avoid drawing the following conclusions in the light of this argument.

1. Any language which is capable of being understood by more than one person must consist in the first instance of words and expressions whose primary semantic function is to pick out or to refer to recurrent features of the common public environment of speaker and audience.
2. The fundamental empirical propositions which provide, in some sense of that term, the foundations of all our empirical knowledge are, and in so far as they are available for public discussion necessarily must be, particular propositions about the current state of their common publicly observable environment, the truth of which can be agreed between speaker and audience, since without that agreement there can be no agreement between them as to how the words which serve to express those propositions are being used and hence no possibility of mutual understanding between them.
3. The only way we have, or conceivable could have, of characterising a private experience of ours in such a way that what we say about it is intelligible to another, the only way in which we can, or conceivably could, explain what a word like 'pain' means, where 'pain' is one of that very small group of bodily sensation words which are the names of a particular kind of private experience, is by pointing to the standard publicly observable concomitants of the kind of private experience in question. In other words, we can only describe an experience or explain the meaning of a private sensation word like 'pain' either by pointing to the publicly observable state of affairs in the environment which normally produces the experience in question and whose presence in our environment we normally recognise by virtue of that experience, or else by pointing to the kinds of publicly observable things which an experience of that kind characteristically inclines us to say or do. (Place 1977 p. 9)

***Selbstbeobachtung* as phenomenological introspection**

But while this argument clearly shows the doctrine of stimulus error for the nonsense that it is, there is still a use for the term *Selbstbeobachtung* to connote that ongoing process of observation which results in a description of the qualitative aspects of an ongoing or recently completed experience. Once it is disentangled from the doctrine of stimulus error, *Selbstbeobachtung* becomes indistinguishable from the kind of phenomenological introspection which focuses on the sensory quality of an experience rather than

its meaning. As Wundt repeatedly reminds us⁶, the direction of gaze in *Selbstbeobachtung* is no different from that in those forms of observation in which we examine a feature of the stimulus environment as it impinges on our sense organs. It is just that observation sometimes allows us to say something about the process of observation itself, about what it seems to us that we see, hear, smell, taste and feel, over and above what we actually see, hear, smell, taste and feel.

It is the distinguishing feature of this kind of mental self-knowledge that both the observation and what is observed is an ongoing process. What is observed, moreover, is a palpable qualitative experience of which it makes sense for another person to ask what it was like to undergo it. All such experiences in so far as they are describable are sensory in quality, even though they are not always sensory in their causal origin. A typical example of a self-report based on *Selbstbeobachtung* in this sense would be a report of a dream as consisting in a succession of visual, auditory and visuo-auditory images in which the colours of objects and the quality of sounds play a significant role.

Brentano's innere Wahrnehmung

This kind of *Selbstbeobachtung* contrasts with Brentano's (1874) *innere Wahrnehmung* or 'Inner Perception' which is the intuitive understanding of and consequent ability to report the meaning or significance which some experience has for the experiencing subject or in which some thought or other mental act consists. Considered as an event, *innere Wahrnehmung* consists in the instantaneous emergence of a capacity or tendency which, once it has emerged, persists over time as an unchanging dispositional state rather than as a continuously changing process. The meanings which are accessed in this way are not and can never be what Titchener supposed they sometimes are, namely, palpable sensory or para-sensory experiences (images) which are somehow attached to the experiences of which they are the meaning. Consequently they are not the kind of thing that one ever observes in the way that one observes an experience like a sensation or a dream image. One simply knows intuitively what an experience means to one.

As Wittgenstein argues in *Philosophical Investigations* I (Wittgenstein 1953, pp. 53-88), understanding the meaning of a linguistic expression is a matter of having a disposition, the capacity or propensity to "go on", to talk and behave in a broadly specifiable way. In a case where the expression is understood correctly one is in a position to make the correct extrapolations. In a case where the expression is misunderstood one is still disposed to extrapolate, but in the wrong way. In a case where the correctness or incorrectness of the interpretation is not an issue, as when an expression is used in an idiosyncratic way for the purposes of one's own thought, there is a disposition to extrapolate which is constrained only by the habit of conforming to the conventions of linguistic communication.

It is a consequence of this dispositional account of what it means to understand or interpret something in a particular way that when someone reports what a thought or experience meant to him or her, the report is an unfolding of the disposition to talk in that way which was present only potentially (and hence without the occurrence at the time of any words or images, exactly as described in Würzburg experiments) when the thought or experience first occurred. This, indeed, is precisely how Wundt explains the Würzburg findings⁷.

For those who are not familiar [with] Humphrey's (1951) book *Thinking: An Introduction to its Experimental Psychology* which is just about the only accessible source in English or, indeed, in any language for the work of the Würzburg School, it may be helpful at this point to give an example of the kind of results which were obtained in these experiments. The following is a typical report provided by one of the subjects (Dürr):

"Is this correct: 'The future is just as much a condition of the present as of the past?'" Answer: "No." (10 secs.) "First I thought: that sounds like something correct (without words). Then I made the attempt to represent it to myself. The thought came to me: Men are determined by thoughts of

⁶ For example in Wundt (1897 p. 2), quoted in Place (1989) p. 132.

⁷ For an account of Wundt's explanation of the Würzburg results, see Humphrey (1951) pp. 110-1.

the future. Then, however, immediately the thought: *that the thought of the future should not be confounded with the future itself; that such confusions, however, constitute a frequent dodge in philosophical thought. (Of words and images there was throughout no trace.) Thereupon the answer: No.*" (Quoted by Humphrey 1951, p. 58 from his own translation of Bühler 1907, p. 318. The italics are Bühler's.)

If, like me, you find it helpful to think of such things in terms of a simple mechanical model, a good model for what is going on in a case like this is the operation of an electromagnetic relay. The electromagnetic relay is an electromagnet which, when energised, has the effect of opening and closing a set of switches. This has the further effect of closing parts of some circuits and opening parts of others, without necessarily either completing a circuit or breaking one which was previously complete. Consequently, it may not at the time produce any manifest change in the output of the system of which the relay forms part. The change that has occurred only manifests itself when some other switch is closed, thus completing a circuit and generating an output which would not otherwise have appeared, or when the closing of another switch fails to complete a circuit and generate an output which it would otherwise have done. This is a perfect analogy for the occurrence of the kind of imageless thoughts described in the Würzburg experiments. The occurrence of the thought without the occurrence of any words or images at the time is the energisation of the relay which opens some switches and closes others without either completing a circuit or breaking one that was previously complete. But when the observer is asked to explain the content of his thought, this has the effect of closing a switch controlling the verbal output with the result that all those things which the observer was, as it were, "primed" to say by the opening and closing of the relay switches, when the relay was energised, now come pouring out.

The infallibility of mental self-knowledge

Drawing a distinction within mental self-knowledge between Wundt's *Selbstbeobachtung* and Brentano's *innere Wahrnehmung* raises the question as to how these two forms of mental self-knowledge match up to Descartes' claim that, whereas knowledge of the external world is always fallible, knowledge of the thinking "I" is immune from error. Brentano certainly thought that his *innere Wahrnehmung* was immune from error, as Descartes had claimed. But, although he does not, as far as I know, emphasise his departure from the classical Cartesian tradition in this respect, Wundt is equally clearly committed to the view that *Selbstbeobachtung* is susceptible to error, even though the error he thought it was subject to (stimulus error) is, as we have seen, a nonsense. In my view, they were both right, though perhaps not in either case for the right reasons. Wundt, as I see it, is right in thinking that *Selbstbeobachtung* is subject to error, not because it is subject to stimulus error, but because, as Charlie Martin first pointed out to me at Adelaide in 1954 and as I described it in a 1989 paper,

although sensation reports may be private in the sense that only the possessor can report and describe them, they are not incorrigible. For the owner of a sensation can indeed make a mistake in his description of it, even though only he is in position to recognise the mistake and correct it. (Place 1989 pp. 121-122)

The burden of the paper in which I reported Charlie Martin's insight that sensation reports are not incorrigible was to describe another insight of Charlie's, namely, that the reason why sensation reports appear to be immune from error is because of the very minimal claim that they make about what is actually the case. They claim only that it is *as if* so and so were the case, not that anything, other than the occurrence of the sensation, actually *is* the case.

Later in the same paper, I describe an extension of what I call "the linguistic by-product theory of introspection" from descriptions of

experiences of sensory and para-sensory nature so as to provide an account of the self-knowledge that we have of our own mental dispositions, both cognitive dispositions such as beliefs and volitional dispositions such as wants and desires. (Place 1989 p. 133)

But although I do not emphasise the point in the paper, it is clear on reflection that there is an important difference between this theory of mental self-knowledge as applied to reports of sensations (*Selbstbeobachtung*) and the same theory as applied to our knowledge of our own mental dispositions (*innere Wahrnehmung*). For in the latter case, unlike the former, our mental self-knowledge is indeed in some respects immune from error, as Descartes and Brentano claimed. But, as I point out in the paper, there is nothing mysterious about this, nothing that should tempt us to make such reports the foundation for an epistemology. It is simply that such reports are self-verifying manifestations of the disposition whose existence they report. As Descartes puts it in *Meditation II*:

this proposition 'I am', 'I exist', whenever I utter it or conceive it in my mind, is necessarily true.
(Anscombe and Geach 1966 p. 67)

In other words, I give irrefutable evidence of my own existence whenever I utter a statement to that effect.

In the 1989 paper my account of this self-verification theory of the infallibility of *innere Wahrnehmung* continues as follows:

I outlined a theory of our knowledge of our own beliefs along these lines in a paper published in *Analysis* in 1971. The relevant passage in the paper reads as follows:

It might be argued on this theory⁸ that to believe that *p* is to be disposed to assert *p* on occasions when the truth of *p* is a relevant consideration. Now since I cannot assert that I believe *p* without *ipso facto* asserting *p*, it would follow that in asserting that I believe *p*, I have *ipso facto* exercised and thus displayed my disposition to assert *p*. On this view, I cannot be mistaken in asserting that I believe *p*, because the statement 'I believe *p*' is a self-verifying statement. It cannot be asserted without *ipso facto* demonstrating its own truth." (Place 1971, p. 197)

A similar theory can be developed to account for our knowledge of our own wants and desires by picking up on the suggestion first made, to my knowledge, in a paper by Stephen Toulmin (1961) in which he points out that sentences like *I want coffee* are commonly used as a way of asking for what is wanted and thus constitute what Ryle (1949) calls "an exercise" of the disposition to take steps to secure what one wants in which wanting something, arguably, consists. This is another case where the sentence *I want coffee*, in its capacity as an indicative information-providing sentence, may be regarded as statement which, in its other capacity as an imperative, provides its own verification. In this case one is perhaps more hesitant in the light of Freudian considerations to embrace the infallibility that, as we have seen goes with knowledge based on self-verification; but what Freud is claiming, surely, is that we can be mistaken in *denying* that we want something, something that we would never think of asking for, not that we could be mistaken in thinking that we want what we have just asked for. (Place 1989, p. 133)

The problem of distinguishing reports of *Selbstbeobachtung* from those of *innere Wahrnehmung*.

While the distinction between *Selbstbeobachtung* and *innere Wahrnehmung* is clear enough in principle, in practice the distinction is sometimes exceedingly difficult to draw. The reason for this is that it is not always possible to distinguish a reference to the publicly observable concomitants of similar experiences, which, as we have seen, we use to characterise a private sensory or para-sensory experience, from the interpretation of the meaning or significance of the stimulus giving rise to that experience which the current experience suggests. The problem is well illustrated by the example of the so-called "duck-rabbit" which Wittgenstein borrowed from Jastrow's (1900) book *Fact and Fable in Psychology* and which he discusses at length in *Philosophical Investigations II* (Wittgenstein 1953 pp. 194-9). If someone says in response to looking at this figure *Now it's a rabbit* and a few moments later *Now it's a duck*, are they

⁸ The theory referred to is "Ryle's dispositional theory of mental concepts." In fact the theory as described is closer to R. B. Braithwaite's dispositional theory of believing, as outlined in Braithwaite (1932).

describing the *appearance* of the figure - *Now it looks like a rabbit Now like a duck?* Or are they reporting the way the same figure is being interpreted - *Now I see it as a rabbit ... Now I see it as a duck?* Both interpretations are equally plausible.

The historical significance of the Würzburg School and the controversy it provoked

What are we to say in the light of this discussion about the significance of the work of the Würzburg School and the controversy it provoked

- (a) for the history of Psychology,
- (b) for contemporary Psychology, and
- (c) for current debates within the philosophy of mind?

With regard to the historical significance of the Würzburg School and the controversy it provoked, the most important legacy was undoubtedly the fuel it provided to the behaviourists who rejected introspection as a method of observation appropriate to what purports to be an empirical natural science. Particularly damaging in this connection was the suggestion that the differences in the results obtained in the Würzburg laboratory from those obtained at Cornell, when Titchener's students tried to replicate the Würzburg experiments⁹, were directly attributable to the different theoretical training which introspective observers received in the two laboratories. The suggestion that introspective observations were invariably and inescapably contaminated by the theoretical preconceptions of the introspective observer dealt a death blow to Wundt's conception of *Selbstbeobachtung* as a professional skill available only to the trained psychologist, since only he knows how to avoid the pitfalls of stimulus error. Henceforth, the only introspective observations that could be trusted as free from this kind of theoretical contamination were those provided by the psychologically naïve, and, as we all know, the introspective reports of the psychologically naïve are for most purposes remarkably scrappy and devoid of psychological interest. Not surprisingly, most psychologists were happy enough either to go along with the behaviourists in abandoning introspection altogether or to adopt the so-called "phenomenological introspection" recommended by the Gestalt Psychologists in which the naïve subject is encouraged to describe his or her perceptual experience in whatever way seems most natural. On this interpretation, the work of the Würzburg School and the controversy it engendered was the key event which undermined the first phase of the history of Psychology as an independent academic discipline in which it was dominated by three men, Wilhelm Wundt, Franz Brentano and William James, who all agreed that Psychology is an empirical science whose empirical data derives from some form introspection, either *Selbstbeobachtung* or *innere Wahrnehmung*. It ushered in the second phase in which, for the next half century from c.1912/3 to the early 1960's, psychology was dominated the three major Schools: Behaviourism, Gestalt Psychology and Psycho-analysis.

The significance of the Würzburg School and the controversy it provoked for contemporary psychology

By the early 1960's Gestalt Psychology with all its founding figures now dead had run out of steam. Psycho-analysis, though still very influential was being challenged as a therapeutic procedure by alternative therapies, based, in the main, on behaviourist principles. At the same time, behaviourism itself was being challenged by the serial-digital computer as a model of the functioning of the brain in its control of behaviour. These changes, particularly the latter, ushered in the so called "Cognitive Revolution", which constitutes the third phase in Psychology's history and extends over the next thirty years down to the present day.

The history of introspection within the cognitive tradition falls into two phases: the phase of hope and the phase of disillusion. In their initial enthusiasm to break with what they saw as the constricting

⁹ See Humphrey 1951, pp. 119-122.

strait-jacket of behaviourism, cognitive psychologists were drawn to introspection as a potential source of information about processes in the brain corresponding to the computational processes which drive the serial digital computer. The study which typifies this phase in the history of the cognitive approach to introspection is Newell and Simon's (1972) book, *Human Problem Solving*, which reports a research project on that topic, extending back over the previous fifteen or so years. However the approach to the investigation of the processes of thought adopted in this research owes more to the Gestalt tradition, as represented by Wertheimer's (1945) book *Productive Thinking*, and to behaviourism, than it does to introspective psychology of the thought processes as practised by the Würzburg School. Thus:

- (a) the thought processes investigated are those of naïve subjects, rather than trained introspective observers;
- (b) the context in which these thought processes are studied is one in which the subject is confronted with a logical or mathematical problem for which there is only one correct solution, such that the time taken to hit on the correct solution can be unambiguously recorded and related to the thought process involved;
- (c) the focus of interest is on the functional properties of the thought processes recorded in facilitating or, in some cases, delaying the emergence of an effective solution, and not, as it was during the epoch of classical introspective psychology, on the purely descriptive features of thought;
- (d) instead of asking the subject to report the thoughts which occurred during the preceding phase in which a solution to the problem was being worked out, the subject was asked to "think aloud", so that the thoughts could be recorded objectively as they occurred.

This substitution of thinking aloud for introspective reports on a hidden mental process reflects the influence of behaviourism, both in the preference for objective over subjective data and in the implicit endorsement of the view that thinking, in the relevant sense, is simply a matter of talking to oneself in the natural language of interpersonal communication.

The influence of the serial digital computer model manifests itself in this study in the construction of computer programs designed to simulate the thought processes recorded, thereby providing evidence that the brain and the computer function in the same way. The relative ease with which such programs were constructed gave substance to the hope that these two sources of information, introspection and computer simulation would mutually reinforce one another and between them provide a comprehensive and coherent picture of the workings of the mind.

Unfortunately this early confidence in the congruence between the evidence from introspection on the one hand and computer simulation on the other was not supported by later work. In particular Nisbett and Wilson's (1977) paper called into question both the accuracy and completeness of introspective reports as evidence for the thought processes involved in problem solving. Although Nisbett and Wilson do not cite the Newell and Simon study, it is clear from the evidence they do cite that the logical coherence of the thought processes recorded by Newell and Simon, without which effective computer simulation would have been impossible, depends on

- (a) the use of thinking aloud in place of introspective retrospection as a way of gaining access to the thought processes involved, and
- (b) the presentation of mathematical and logical problems which demand the kind of formal deductive reasoning which is most easily programmed on a serial digital computer.

Once attention was directed towards problems of other kinds which do not lend themselves to solution by calculation and deductive reasoning, and where access to the thought process has to be by subsequent introspective report, rather than by thinking aloud, cognitive psychologists were compelled to conclude, as the Würzburgers and Titchener had done before them, that many intellectual functions are performed in what Titchener describes as "this purely physiological way", without any accompanying introspectible event. But because the serial digital computer model requires that every intellectual or skilled performance be mediated by a sequence of logically ordered deductive steps, they were compelled to conclude from

this that many of the most functionally significant cognitive processes are 'unconscious' and thus inaccessible to introspective scrutiny.

This disillusion with introspection as a source of information about the cognitive processes involved in human performance led many cognitive psychologists to abandon it entirely in favour of computer modelling. If you assume that the brain functions as a serial digital or von Neumann computer, given a bit of ingenuity and a few additional and, within the framework of the hypothesis, plausible assumptions, it is possible to construct a model showing the computational steps such a computer would have to go through, and hence how it would need to be programmed, in order to reproduce the performance of a human being or other living organism on a given task. Such a model, it was argued, provides a much better guide than introspection to the largely unconscious cognitive processes that are actually going on and generating the performance observed.

Skinner's distinction between contingency-shaped and rule-governed behaviour

There is now some reason to think that this third phase in the History of Psychology is coming to an end with the advent of what is known as the "Connectionist Revolution" in artificial intelligence (Rumelhart, McClelland and the PDP Research Group 1986). While it is conceded that connectionist, neural network or parallel distributed processor (PDP) models can never hope to compete with the serial digital computer in performing those repetitive computational tasks which the human brain doesn't perform very well anyway, it is argued that neural networks are much more like the brain than is the serial digital machine both in their architecture and in their *modus operandi*. Consequently the existence of models based on devices of this kind seriously undermines those based on the increasingly discredited hypothesis that the brain operates as a serial digital or von Neumann computer. At the same time the increasing adoption of connectionist models seems likely to provide new impetus for the use of introspection as a source of information about the thought processes which actually occur and exercise control over human behaviour. The basis on which this prediction is made is the observation of a remarkable convergence between the properties of neural networks and the behavioural principles formulated by B. F. Skinner in *The Behavior of Organisms* (Skinner 1938) and subsequent writings. The revival of interest in Skinner's position which this convergence foreshadows should draw our attention, I believe, to an important but neglected contribution made by Skinner to our understanding of the thought process.

According to Skinner, all behaviour is an adaptation to what he calls "the contingencies" operating in the environment of the behaving organism. A *contingency* in Skinner's sense is a three term relation which holds between a set of *antecedent conditions* under which some behaviour is called for, the *behaviour* emitted by the organism under those conditions, and the *consequences* of behaving in that way under those conditions. In his paper 'An operant analysis of problem solving' (Skinner 1966), republished as Chapter 6. of his (Skinner 1969) book *Contingencies of Reinforcement*, Skinner distinguishes two different ways in which, in the case of human behaviour, this adaptation to the prevailing contingencies is achieved:

- (a) by *contingency-shaping* in which the organism's propensity to emit similar behaviour in the future is automatically and "unconsciously" shaped by the immediate consequences which such behaviour has attracted in the past,
- (b) by *rule-governance* in which behaviour is emitted in response to the self-directed rehearsal by the human thinker-agent of a verbal formula or "rule" which said by Skinner to "specify" the contingency by which the thinker-agent takes himself or herself to be confronted.

Viewed from this standpoint, it is evident that all of the learned behaviour of animals and pre-linguistic children is contingency-shaped. So is all the habitual behaviour and skilled performance of linguistically competent older children and adults. Rule-governed behaviour in Skinner's sense only manifests itself when the human thinker-agent is confronted by a problem situation for which he or she has no readily available contingency-shaped (i.e., habitual) response. The rule invoked in order to guide behaviour in such circumstances may have been constructed by the thinker-agent himself or herself, either at the time

or previously, on the basis of his or her encounters with similar contingencies in the past, or it may have been derived from the verbal behaviour of some other speaker. If it is successful, contingency-shaping of behaviour by its immediate consequences will begin to take over as the behaviour is incorporated into the agent's habitual repertoire.

How does this distinction of Skinner's impinge on the issue between the neural network and classical computational models of brain function. I suggest that it impinges in three ways:

- (1) the process whereby a neural network learns to discriminate between two stimulus patterns is indistinguishable from that described by Skinner (1938, Ch. V) in the behaviour of organisms such as the pigeon and the rat and which, in terms of the 1966 distinction is "contingency-shaped";
- (2) the serial-digital or von Neumann computer is a device designed to perform those computational tasks which the human brain did not need to perform or have performed for it, before it acquired the ability to adapt to the contingencies confronting it by constructing "rules" in Skinner's sense of that term, and which, since it operates as a parallel distributed processor, it performs comparatively slowly and inefficiently, in so far as it performs them at all;
- (3) given this distinction, there is no need to postulate the unconscious computational processes which the serial digital computer model requires in order to account for those aspects of human performance which are not accompanied by any introspectible mental process.

The absence of an introspectible process in circumstances where, on functional grounds, such a process might have been expected, is explained on the hypothesis we are examining by supposing either that the aspect of performance in question has been contingency-shaped from the outset, or, if it is the kind of behaviour which was subject to control by an introspectible thought process when it was first emitted, has since become contingency-shaped as the actual and immediate consequences of the behaviour take over from those specified in the rule. This leads to the empirically testable prediction that those aspects of human performance which *are* accompanied by an introspectible or otherwise objectifiable thought process are those where the thinker has no ready made contingency-shaped response, where the function of the thought process is to specify the contingency confronting the thinker in such a way as to suggest an appropriate strategy for dealing with it.

Obviously, this issue goes to the heart of the debates between the Würzburg group and its sensationalist critics. But whether the behaviourists and their connectionist allies will see it as an important issue for them remains to be seen. If they do, may be the history of the Würzburg experiments and the controversy they provoked will once again become a live issue in psychological research.

The significance of the Würzburg School and the controversy it provoked for contemporary issues in the philosophy of mind.

It is probably true to say that the significance of the Würzburg School and the controversy it generated for contemporary mainstream psychology is minimal and likely to remain so, until such time as the topic of introspection becomes a major focus of current research interest once again. However, in the philosophy of mind, at least as that department of philosophical enquiry is understood in the English-speaking philosophical world, the issue which separated sensationalists, like Wundt and Titchener, from intentionalists like Brentano and the Würzburg School, is very much alive. It appears in the controversy between those like Tom Nagel (1974) who see the *qualia* of sensory experience as constituting the essence of the mental and those, like Donald Davidson, for whom the essence of the mental is, as it was for Brentano, intentionality or meaning, interpreted in Davidson's case in terms of the ascription of propositional attitudes. There don't seem to be many who share my own belief that our concept of mind needs to be big enough to embrace both *qualia* and intentionality, both *Selbstbeobachtung* and *innere Wahrnehmung*, without feeling compelled to try and reduce the one to the other in the vain pursuit of that will o' the wisp, the essence of the mental.

However, in the debate, as currently conducted, there is not much attention paid, so far as I am aware, to the epistemology of introspection as a source of mental self-knowledge. This may reflect the

disrepute into which epistemology in general has fallen in recent years, due, no doubt to the commitment of most of its practitioners some form of scepticism and/or anti-realism. Here again there is some reason to think that [the] tide of fashion may be on the turn, and that, before long, epistemology will be seen as the handmaiden of ontology, instead of its enemy. If this happens, one of its consequences might be a shift in the focus of interest away from reasoning from *a priori* assumptions about how truth is to distinguished from falsity towards looking at empirical evidence as to how in practice that distinction is drawn, in everyday life, in the law and in science¹⁰. If epistemology moves in this empirical direction, a practice that cannot fail to come up for consideration is the practice of using introspection as a source of information about human thought processes.

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¹⁰ A move in this direction would seem to be one of the consequences of adopting Quine's (1969) concept of a "naturalized epistemology".

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