No Likely Meeting of Minds

Controversy and Charity in Cognitive Science

Bob Anderson
Horizon Digital Research
University of Nottingham

Graham Button
Xerox Research Centre Europe
Xerox

Wes Sharrock
Department of Sociology
University of Manchester

FOREWORD

This discussion dates from 1992-93 when we were at the Cambridge Laboratory of Xerox Research Centre Europe. It emerged from conversations we were having about how our interests in the social organisation of technology use might bear on the business interests of Xerox. It seemed to us that the 'controversy' between Alonso Vera & Herb Simon and Lucy Suchman was an illustration of the problems we were grappling with. Both had to do with how to engage with an entirely different set of analytical motivations and attitudes (in our case, those of business) in a positive and creative way. We were not then and are not now concerned to adjudicate on the rights and wrongs of the sides being taken in the Vera & Simon and Suchman debate (or at least not in this discussion). What we had our eye on is how to move from confrontation between standpoints to common ground — indeed, whether this was even possible. The Alonso & Simon paper was published with a response by Suchman as Alonso Vera & Herbert Simon: *Situated Action: A Symbolic Interpretation* in *Cognitive Science* vol 17(1) 1993 pp 7 - 48, 1993. Our quotations are from the transcript which was circulated in advance of publication. We have not sought to bring these or our discussion up to date. Neither have we provided anything other than the lightest literature pointing references to the arguments we raise. We make our thinking available now even though we are quite sure we would today frame our views differently. It is offered simply as a part of the record and a document of its time.

A paper setting out very similar arguments was published as Wes Sharrock & Graham Button (2003) Plans and Situated Action Ten Years On, *Journal of the Learning Sciences*, 12:2, 259-264,

INTRODUCTION

To judge from their general expository statements (Lave 1988, Lave and Wenger 1991) the proponents of "the situated approach" to action and cognition define themselves as a radical alternative to conventional accounts. Indeed, part of the motivation for developing the situated approach in the first place was to reject what was seen as the abstracted and de-contextualised approach of the pre-dominant theories and studies. It comes as something of a surprise, then, to learn from Alonso Vera and Herbert Simon (Vera and Simon 1992, hereafter V&S) that far from being an alternative to cognitivism, the central ideas of the situated action approach can be easily accommodated within it.

> *In this paper, we wish to examine whether SA is actually antithetical to symbolic manipulation. To anticipate our conclusions, we find there is no such antithesis: SA systems are symbolic systems, and some past and present symbolic systems are SA systems (V&S, p. 3)*

Their argument does not just neutralise the self-proclaimed "threat" from the situated action viewpoint; it shows how that approach actually supports the orthodox view.

Given the vehemence with which the situated approach has pressed its case, we find this a very strange state of affairs. How can these two diametrically opposing appraisals of arguments, positions and findings be possible? How can one side find a set of propositions exhilarating, insightful and challenging to the prevailing conventions, while the other finds them to be simply extensions or instantiations of that very orthodoxy? Part of the answer is that both sides fail to undertake a sustained attempt to understand and appreciate the difference which differences in their investigative pre-suppositions might make. Indeed, in the case of V&S, there appears to be no appreciation that differences in pre-supposition are actually in play, let alone any understanding of what those differences might amount to.

We have come to the view that this is because both sides exhibit a similar attitude in that both lack a sense of 'interpretive charity' and do not ask themselves why their opponents hold the views they do. In addition, both adopt what we can only call 'egological projection', where they are predisposed to assess their opponent's views in terms of their own. Naturally, this assessment is uniformly negative. Whilst, as we say, both parties do exhibit these characteristics, they are most clearly found in V&S' account. Here, for instance, is the V&S account of driving around a curve in the road.

> *.... the retinas of the driver are receiving information that is interpreted by an elaborate encoding scheme (but without awareness) as a curve in the road, and the curve is usually symbolised as such, without awareness. This interpretation initiates (neurally, but also without awareness) the symbol emissions which control muscular tensions that cause the arms to move, that cause the steering wheel to turn, that causes the wheels of the car to turn, that causes the car to turn left, that causes it to follow the curving road .... It is incorrect, therefore, to say that situated action of this sort is not carried out symbolically. (V&S, p. 18)*

Now no-one would deny that one can describe the activity of driving as chains of causation like this. Equally, no-one would want to argue that all descriptions of driving must incorporate accounts of what the driver thinks, feels, senses, and intends. Egological projection is the presumption that if someone else appears to hold divergent investigative interests to me, those views are, somehow, aligned or alignable with my own. As we will see, V&S assume the situationalists must mean what they mean by concepts like plans, actions and their relationship. As so often, the parties appear to be separated by their common vocabulary.

Having come to this conclusion, we feel the most useful contribution anyone could probably make would be to clearly identify the pre-suppositional differences underlying the standpoints which V&S and the situationalists hold and provide a summary of their implications.[1] For once, then, we will not join the argument. We will save that intervention for another occasion, contenting ourselves now with ground clearing, path straightening, and boundary marking. We have chosen to focus primarily on the situationalists as represented by Lucy Suchman. We do so because she seems to have been profoundly misunderstood by V&S (and hence, we suspect, by many others within Cognitive Science). V&S's own position is, of course, at one with by cognitive science's orthodoxy. So, before getting fully underway, a short summary of this orthodoxy will provide us with sign posts for our later discussions.

THE ORTHODOX POSITION.

V&S give a brilliant summary of the standard position in cognitive science (V&S pp 4-7). It consists of a number of interrelated propositions.

1. A physical symbol system comprises a number of components such an information processor capable of representing the world and a memory capable of storing these (symbolic) representations.
2. Such systems are capable of causally interacting with the world.
3. A symbol system may take many different instantiations of the same formal properties but all instantiations are ultimately physical.
4. Symbol systems designate or denote.
5. Perception is the processing and encoding sensory stimuli as symbols. These encodings result in either 'external' or 'internal' representations.
6. The interrelation between perception, processing, and motor response is usually extremely complex.

For V&S the actor is a physical symbol system conforming with these formal properties. That, we suggest, is their standpoint.

[1] Throughout this discussion, we will attribute positions to both sides on the basis of what we presume, from their writings, they adhere to. Hence we are using them as prototypes for particular argumentative frames. If a proponent of the cognitive science orthodoxy or situationalism wants to quarrel with our versions of their views, this will not debilitate the broad case we want to make. That argument is, in the end, about arguments across frames of reference not simply or only the particularities of the debate over situationalism.

THE STATUS OF 'STANDPOINTS'

We begin with a straightforward assertion. The human and social sciences are characterised both by the number of standpoints they exhibit and the unending dispute over which should hold sway. This may be a source of irritation and regret; but there it is. We draw a simple conclusion from this diversity and contention. From the point of view of the totality of human and social sciences, all departure points are essentially contestable. The term 'essentially' is crucial here. While at some times and in some places particular ones may predominate, the reasons for this are institutional not epistemological. Acceptance of relative superiority is contingent on that myriad of conditions which Foucault (1970) took to be the subject matter of an archaeology of knowledge and not the intrinsic logic of the position itself. Foucault says these conditions are:

> *... the influences that affected (scientific consciousness), the implicit philosophies that were subjacent to it, the unformulated thematics, the unseen obstacles; it describes the unconsciousness of science. What I would like to do, however, is to reveal a positive unconscious of knowledge: a level that eludes the consciousness of the scientist and yet is part of scientific discourse, instead of disputing its validity and seeking to diminish its scientific nature. (Foucault 1970, p xi emphasis in original)*

We cite Foucault here not because we would necessarily accept his analysis but to indicate the domain we are trying to open up. Security of standpoints is very much part of science's "positive unconsciousness". As we say, in contemporary human studies all are open to challenge. This essential contestability of starting points leads us to another conclusion. Whether they will or no, since the contestability of standpoints is carried on through philosophical arguments, the social and human sciences are embroiled in philosophy. We do not have to decide if this always has to be the case. It is perfectly feasible that the long looked for unification of the sciences (for example) might occur; that possibility does not touch our point. As of now, it hasn't, and to be honest it does not look likely that it will in the near future. At present, the social and human sciences are endemically disputatious and these disputes originate in philosophical disagreements about standpoints or the departure points for enquiry.[2]

A PAIR OF BLIND SPOTS

The failure to recognise or give due weight to the fact of differences in standpoints and their importance leads to what we have come to think of as a pair of blind spots which the debate over situationalism displays in its own idiosyncratic way.

PATTERNS OF (SCIENTIFIC) CULTURE

In a famous description of the ways of the Plains Indians, Ruth Benedict (1935) drew a contrast between what she called the Dionysian and Apollonian worldviews. The former was restless, given to violent outbursts of activity, millennial religious beliefs and associated ecstatic rituals.

[2] Appealing to a model of science (usually mathematical physics) is of little avail here either, since just what that model is and how its components map onto the disciplines we are discussing its itself a matter of deep dispute.

The latter was quietest, far more passive and contemplative in orientation. Fun though it might be to go through the exercise, we do not want to argue that individually or collectively scientists are either "Navaho" or "Zuni" in type. Rather than talk in these Nietzchian archetypes, we want to us the contrast to indicate differences in the conception of scientific activity. having done so, the characters from Greek mythology most likely to encapsulate the contrasts we have in mind are Hercules and Sisyphus. Hercules, you will remember, was given a list of seven discrete tasks to perform. As he worked his way down the list he got closer and closer to his goal. His achievements cumulated. The thing about Hercules' labours was that they were all of a practical kind and amenable to his foremost quality — brute strength cunningly applied. Sisyphus, of course, was condemned to one eternal task: rolling a stone up a slope. Every time he struggled almost to the top, the stone would escape and roll over him. In many ways, V&S epitomize the Herculean outlook. They seek an engineering science of the artificial; one within which cumulative knowledge and discrete projects build successively on one another. Once one task is complete, we move on to another. Here is but one indication of this orientation.

> *Over the past 35 years, a substantial number of symbol systems have been constructed and tested, successfully, for their ability to simulate human thinking and learning over a wide range of task domains. (V&S, p. 7)*

Suchman has much more in common with Sisyphus. Her worries are of a clarificatory and dialectical kind, and the problems she takes up are unending. She is concerned with how a standpoint or frame of reference is to be applied and what order of findings it licenses, not with heaping those findings up, sorting through them, enunciating a conclusion, and moving on. That the Herculean outlook dominates within the cognitive and natural sciences at the moment, and has done so for some time, should not blind us to alternatives which have an equally long lineage.

FACTS AND THEIR SIGNIFICANCE

Here we want to bring out two features. The first is the openness with which a specific set of "facts" can be taken. V&S argue that, as a matter of fact, despite what Suchman appears to say (more of this later), people do engage in planning and follow those plans through in their actions. Suchman, however, is not concerned with "the facts" construed in this way. For her, what is at issue is how, given her standpoint, one might wish to describe what V&S call 'planning' and 'following plans' and how, these and similar activities might be studied as they are performed in actual settings.

Second, and obviously related, is the import given to the buttressing evidence used in support of an interpretation of facts. Thus, *contra* Suchman, V&S turn to recent developments in robotics to demonstrate the veracity of their position. In doing so, they fail to see that what Suchman is questioning is not what robotics has done, but what one would like to say about its achievements. Her position is not, as V&S appear to believe, a rejection of the advances in robotics. It is, rather, to ask exactly its import might be. Is research in robotics of any relevance to research in psychology? And if so, how would one go about determining what that relevance should be and how to assess it? Disregarding the openness of choices about "the facts" in hand can, and often does, lead to the mistaken view that opponents are actually talking about the same phenomena when reflection would show they clearly are not.

We will now turn to the debate between V&S and Suchman to illustrate how the attitudes we have described and their associated blind spots have their effects.

ACTIONS AND THEIR PLANS

We have suggested that V&S underestimate the gulf between their own position and Suchman's. To be fair, this is not entirely their fault. At some strategic points, Suchman words her argument in ways that invite just the interpretation V&S might give. As well as occasionally not wording her argument as felicitously as she might, she is also not particularly explicit about the traditions on which she draws. Suchman's discussion of plans and actions explores one potential set of investigative consequences derived from the work of Harold Garfinkel and then through him, Ludwig Wittgenstein (Garfinkel 1967. Wittgenstein (1956).V&S acknowledge this heritage, but their comments make it clear they do not really appreciate its implications. Moreover, because Suchman treats her own position as self-evidently persuasive, she helps compound the problem.

This is an important point, for one consequence of failing to draw the distinctions we are pointing to clearly is that unwary or unperceptive readers might presume she is speaking from within the tradition she criticises rather than distancing herself from it. This certainly seems to be how V&S have read her proposals. They protest, for instance, that

> *.....(Lucy Suchman has focussed) on the issue of planning, Planning has traditionally played an important role in systems that interact with the environment. A large part of robotics research [at least into the '80's RJA et al] involved improving robots' plans. Suchman takes the rather extreme position that plans play role before and after action but not really during it. The action is carried out at its own independent leveL Before actions plans serve only an organizational or predictive function. Following action, plans serve as "accounts of action taken" or "reports of choices made". There is no causal relation between plans and actions performed by an intelligent system. (V&S, p 14)*

This protest is spurred by two particular passages in Suchman. One introduces a contrast between acts and actions which she attributes to G .H. Mead.[3] The former is

> *.....an essentially situated and ad hoc improvisation - the part of us, so to speak, that actually acts. The other kind of activity is derived from the first, and includes our representations of action in the form of future plans and retrospective accounts. Plans and accounts are distinguished from action as such by the fact that to represent our actions we must in some way make an object of them. Consequently, our descriptions of our actions come*

[3] Irrespective of whether this distinction really does help with the puzzle she is reviewing, because of her general reliance on ethnomethodological arguments the centrality to her thinking of this Meadian dichotomy has to be handled with particular care and, more importantly, it needs to be explicitly triangulated against more usual formulations. If it is not, introducing the distinction is almost bound to lead to confusion, especially among those who are relatively unsophisticated in the ways of sociological theory.

> *always before or after the fact, in the form of imagined projections and recollected reconstructions. (Suchman 1987 p71)*

In illustration of her point, Suchman uses upon the example of

> *....planning to run a series of rapids in a canoe [where] one is likely to sit for a while above the falls and plan one's descent. The plan might go some- thing like "I'll get as far to the left as possible, try to make it between those two large rocks, then backferry hard to the right to make it around that next bunch." A great deal of deliberation, discussion, simulation and reconstruction may go into such a plan. But, however detailed, the plan stops short of the actual business of getting your canoe through the rapids. When it really comes down to the details of handling a canoe, you effectively abandon the plan and fall back on whatever embodied skills are available to you. (ibid p71)*

As we say, at first blush, this example seems to license V&S's allegation that "Suchman takes the rather extreme position that plans play a role before and after action but not really during it". However, a little interpretive charity might have encouraged them to ask whether such an "extreme" and patently odd-seeming view could really be the one which Suchman holds. This particularly so especially when the passages cited are closely associated with the statement that the "alternative view is that plans are resources for situated action, *but do not in any strong sense determine its course*" [emphasis added). She further remarks that the purpose of the plan "is not to get your canoe through the rapids, but rather to orient you in such a way that you can obtain the best possible position from which to use those embodied skills on which, in the final analysis, your success depends." It is plain Suchman does see plans having some role within a sequence of action. They do not simply feature before and after the event. In the case of the canoe journey, planning is scarcely irrelevant to the negotiation of the rapids, for an advance awareness of their course and even the anticipation of a route through them, is surely of considerable and acknowledged advantage in deploying what Suchman calls the "embodied skills" of handling a canoe.

The advantage to be gained by having a plan is not, then, a point of material disagreement. Neither is the practical role plans can have in the unfolding sequence of actions. Though, once again, we accept Suchman's canoe example might appear to suggest this was the point. The real centre of the disagreement is the claim V&S make that *if* there is no causal relation between the plan and the actions for which it provides, *then* there can be no relationship between them. This is totally at odds with the standpoint from which Suchman is arguing. Her challenge is not to the idea that there is a relation between a plan and the action which follows it, but to treating this relationship as a causal one. This suggestion is reflected in her subsequent charge that "....On the planning view, plans are prerequisite to and prescribe action, at every level of detail(p.51) and further that the planning model treats the course of action which follows the preplanned course as a mere playing out of something which has already been predetermined.

What we have here is not a disagreement over facts. Whether negotiating rapids is made more effective by prior planning is *not* the issue. What is in dispute is how to conceive the connection between the plan and the subsequent action which it unquestionably guides. The

re-conceptualising or re- framing move which Suchman is makes cannot be carried on from within the framework being thus re-conceived. We have to step outside. To do this, Suchman calls into play a set of considerations drawn from what she sees as an analogous discussion: the relationship between rules and action as explored by Ludwig Wittgenstein and Harold Garfinkel.

ACTING *IN* ACCORDANCE WITH A RULE

Rules are general prescriptions. They apply to innumerable situations, often many more than we can possibly foresee. Many rules described in mathematics, for example, provide for endless sequences of development and more operations than can ever practicably be realised. (The determination of the precise value of pi, for instance.) The ability of rules to be generally prescriptive has been and continues to be a source of much philosophical puzzlement. One common proposal is that somehow the application of the general rule to the specific situations is decided in advance. The application to all its potentially inexhaustible future situations is already contained within the rule itself. The problem with this answer is that if the application of the rule is already determined, does this not also mean that the actions of someone who is following the rule are also pre-determined? Does acting in accordance with a rule mean following out the sequence of steps which have already been laid down? If so, then probably the only way to explain how learning and applying a rule takes place must be to propose the implanting of some 'inner mechanism' in the mind which dictates behaviour and directs it along the course which is already laid down.

No doubt this account of how rules and actions are tied together is attractive to those who accept the 'planning model'. However, it is a picture which Wittgenstein found deeply dissatisfying?[4] For Wittgenstein, this explanation is the product of a deep confusion about the relationship between general rules and their particular application. The need for a causal connection between the rule and the conduct which follows it — the inner mechanism — derives from a confusion about how actions accord with a rule.

Wittgenstein draws this confusion out by asking a crucially different question. Instead of asking 'What brings about accordance with a rule?', he asks 'What is to count as accordance with a rule?' This directs attention towards the 'internal' connection between the general specification which the rule provides and the formulation of what, in a particular case, the rule requires. Such connections are made within the grammar of the language. Wittgenstein's arguments explicating this "internalism" are lengthy and scattered throughout his writings on mathematics, culture, and the nature of language. In their exposition of his views, G. P. Baker and P. M.S Hacker draw these together. Despite its length, the following is a concise summary of Wittgenstein's position.

> *Philosophical puzzles about such internal relations have straightforward analogues in conundrums about rules and acts in accord with them. The rule of castling in chess seems to anticipate the acts that accord with it, i.e. particular acts of castling correctly. But the rule cannot contain the acts that accord with it. They lie in the future, and may never be performed. So how can*

[4] There is a whole Wittgenstein industry devoted to trying to interpret, clarify, define, defend and defeat his arguments. See for instance Winch (1958), Louch (1966), and Hunter (1973)

> *the rule determine in advance what will accord with it? And how can I be sure that this move is what the rule licenses? How do the rue and an act in accord with it fit together or agree with one another?*
>
> *Unlike those who suppose an external, causal connection, Wittgenstein does not try to explain how a rule can determine what accords with it (or how we can know what accords with it) by reference to mediating entities. Just as the apparent harmony between language and reality was dissolved by clarifying grammatical articulations, so too the relation between a rule and what is in accord with it is rendered unmysterious and grammatical remarks. If the rule reads 'No castling through check' then 'my not castling through check' describes an act in accord with the rule , and 'my castling through check' an act that contravenes it. .... Like the relation between a true proposition and the fact that verifies it, the relation between a rule and an act in accord with it is internal. The rule would not be the rule that it is, nor would this act be the act that it is, if this act were not in accord with this rule. Because the relation is internal, no intermediary can be interposed between its two terms to effect a connection. Nothing can be inserted between a rule and its application as mortar is inserted between two bricks. It is a grammatical platitude that a rule determines what acts are in accord with it, just as a desire determines what satisfies it and a description determines what must be the case for it to be true. Hence it is nonsense to suggest that the rule +2 for the series of even integers leaves it undetermined what it is correct to write after 1000. Likewise, to understand a rule is to know what acts are in accord with it, just as to understand a description is to know what would be the case if it were true or what facts would make it true. The rule and its 'extension' are not two separate things that can be grasped independently of one another, but are internally related. The rule. Add 2' would not the the rule it is if writing' 1002' after' 1000' were not in accord with it. It is in language that a rule and the act in accord with it (or a rule and its 'extension') make contact. (Baker & Hacker,1985 pp.90-91)*

As we indicated in footnote 4, we are very well aware that many philosophers have disputed Wittgenstein's arguments. Our point is, to use our earlier formulation, that all views about these matters are essentially contestable. Wittgenstein's views are deeply sceptical of arguments on behalf of a causal connection between rules and actions. This contestability means we need to explore the differences of each position and not just excise one set of pre-suppositions (the internalist model, say) and blithely replace it with another (the planning model), let alone presume that one reduces to the other. The interest describing a rule's ability to bring about an action through causal connection is not symmetric with an interest in how some action is found to be in accordance with the rule. The latter is a concern with how we determine what counts as following a rule.

Wittgenstein saw the issues primarily in philosophical terms, that is as a matter of clarifying the concepts of logical separation, causal connection and so on. Garfinkel, on the other hand, drew out their significance for empirical sociological investigations. Within sociology, action is defined normatively. For the sociologist, norms are rules of conduct. Garfinkel asked what difference it would make to the practice of sociological investigations to to the orientation which Wittgenstein suggests. Ultimately, he thought, it would mean moving away from the study of causal or other connections between sets of culturally given rules (norms) and the actions which they govern to the investigation of how and when actions are found to be in accordance with rules. Or, to put it somewhat more sociologically, when and how is an action found to conform to the normative order. As we say, this reframing is essentially Wittgenstein's. Garfinkel takes it and applies it to sociology's concerns with norms (cultural rules). Suchman draws upon both in shaping the way she addresses the relationship of plans to action.

Garfinkel's aim was to devise investigative strategies to understand of how the everyday activities acquire uniformity, reproducibility, repetitiveness and standardization; properties which are independent of any particular group of social actors. This, in sociological parlance, is the problem of order. Within sociology, the conventional view was and still is that social order is brought about by conformity to socially shared rules. The causal process which produces this conformity is called "internalisation". Norms are internalised by members of society. Garfinkel approaches the problem of social order from Wittgenstein's point of view. The conventional approach assumes the question to be about whether social actions are in fact in accord with rules, and, if so, with what brings about such compliance. Garfinkel posed the issue differently. He asked what conduct counts as compliance with a rule? How, in any instance, is it decided that there is compliance? Like Wittgenstein, he concluded that the connection between a rule and conduct in accord with that rule is 'internal'. Finding conduct to "follow a rule" is to explicate this internal relation. The relationship is internal to the social organisational setting within which the rules are applied.

In what has become a classic demonstration of approaching rules in this way, Garfinkel set up a "test case" designed to bring this internal relation to the fore (Garfinkel 1967). A set of graduate students were asked to code clinic files by applying a set of coding instructions. These instructions were made as explicit as possible. The coding instructions were designed to be as unequivocal as possible. Despite the length and explicitness of the rules, Garfinkel found that a substantial part of the coders' work involved trying to determine the meaning of the coding instructions. Once this meaning had been arrived at, another substantial portion involved determining what actions would satisfy their requirements. To decide what would be a 'correct' or at least an 'adequate' decision involved further, extensive reference to the purposes, requirements, priorities and of the research project. Even with such a clear set of rules, applying the rule was only possible by reference to the social situation of their use. The application of the rules was internal to that situation.

In a different context, Egon Bittner (Bittner 1974) made the same point with respect to organisational rules. Bittner observed that 'extending to the rule the respect of compliance, while finding in the rule the means for doing whatever needs to be done, is the gambit that characterises organizational acumen' (p.78). Bittner's remarks do not refer to the cynical manipulation of organisational rules (though that may occur). Rather, what he has in mind are the familiar ways in which organisational rules are reviewed to see whether, with a modicum of ingenuity, they can be found to permit the performance of the desired action. Frequently, then, the exercise of organisational acumen involves work to explicate what the rule actually

says. In particular cases, such explications can be a complicated enough to allow a fair degree of 'acumen'.

Determining the meaning of a rule is not always as obviously problematic as the coding example. For example, when we go to the theatre and see a sign saying 'No smoking', we take this to be an injunction prohibiting smoking, and not an assertion that no smoking is going on. Further, if as part of their performance someone on the stage starts smoking a cigarette, we do not suppose that they are in violation of that rule. Contrastively, the 'Exit' sign in the auditorium is not understood as an instruction to leave but indicates where the way out is. The meaning of these terms is unproblematic. Even when understanding the rule is less obvious, the general point remains the same. It is the fit between actions and setting which allows the former to be found to be in accordance with a rule.

The relevant point here is that, on the internalist view, the determination of the meaning of the rule, what it says about what should be done, is fixed within the action over which it has jurisdiction. It is, to use the phrase "situated". It was within the coding exercise that the meaning and application of the coding rules was settled. These decisions might be arrived at by consultation with those who are in charge, or it might be done by those carrying out the coding as they find incongruities between the rules and the cases being reviewed. Either way, the fit of action to rule is found *in situ*, resolved by reference to the practicalities of the work in hand.

PLANS AND THEIR ACTIONS

Following the line we have just sketched, Suchman sees the relationship of plans to actions as internal to a social setting or situation in which the action takes place (*vide* her title). For her, it is how action is found to accord with a plan which is of interest, not the causal bases of action. As we hope we have made clear, this is a fundamentally different conception to the standard approach of cognitive science. Further, the considerations just set out ought indicate why Suchman's reservations about the planning model focus on the idea that a course of action is predetermined by rules. From the point of view she adopts, the sense in which a rule (or a plan) determines what is in accord with it cannot be causal. The rule or plan determines what is in accord with it only in so far as it specifies what it would take to comply with or fulfill it. V&S , by contrast, are exclusively concerned with plans as the causal antecedents of action.

In responding to Suchman's analysis, V&S claim she denies the interrelationship of plans and actions. From what we have just said, this is obviously misplaced. True, she does say the relation between a rule and the action subject to it is not causal, but the principle of interpretive charity coupled with a suspension of egological projection might have led V&S to see she simply means that causal relations are not the only kind of relationship they can stand in. Rules (and plans) certainly can play a role in the conduct of action. They can act as guides to action. The coders, for instance, were using the coding instructions as guides to action. They treated them as standards for correct decision making and proper procedure. What counted as compliance with those rules was something to be decided as part of the work of following the instructions.

It is this which makes V&S's appeal to progress in robotics irrelevant to the argument. Responding to her by saying robots can now be programmed to react more sensitively to changes in their environment misses her point. It is cognitive scientists not their robotic equipment who apply rules and plans, who judge whether a piece of equipment has behaved

or failed to behave as planned. That 'accordance' between plan and subsequent action can be determined (in the 'specification' sense) is simply presupposed by the 'planning model'.

PLANS AND ORGANISATION

Suchman's standpoint stresses the variety of ways in which plans can feature in courses of action. One of these is as a guide for action. An exploration of this variety necessarily involves actual actions in actual settings. The sociological studies which she describes indicate what this might mean. It should now be clear why we earlier suggested that when V&S and Suchman use the word 'plan' they are not, in fact, speaking of the same things. 'Plan' in V&S's usage is a putatively technical psychological construct, one which postulates the existence of an 'inner mechanism' which causally regulates the conduct of action. Suchman is not talking about theoretical mental constructs regulating the organisation of action, but about its self-organising character. Here, 'planning' is conceived as a phase in the course of action, and the plan as a device for organising action. To describe action as 'rule following' or 'planful' is not universal generalisation. Not all action is rule following. Some is, and hence compliance with rules and accordance with plans is something that is to be considered in respect of those cases. But much action is neither rule following nor found to be in accordance with plans.

PLANNING IN FLIGHT

As a way of bringing our discussion to a close, we offer a brief account of planning in the management of action. We will draw on our own investigations of air traffic control.[5] Given that controllers are involved in extensive periods of deep absorption in 'the activity in hand', in many ways air traffic control mirrors Suchman's canoeing example. We will show how plans and the activity of planning feature in the unfolding courses of action by which a sector of air space is controlled.

Planning in air traffic control refers to the periods in which the controller reviews the paper 'strips' providing information about the identities, routes, schedules and projected elevations of the aircraft that are, or soon will be, in the sector of airspace under control. These strips accumulate in racks on the control suite, and identify not just those aircraft under control but also those that are 'pending'. The controller's work-load is variable and roughly reflects the number of aircraft under active control at a given time. Controllers do not regulate their workload. This is given by the rate of arrival of aircraft. Planning is governed by the dynamics of that workload and is a means of managing the problems which it presents.

The paper strips are not just the controller's means of organising work, but also a means of looking into the future. A glance at the 'pending' strips will indicate the number of aircraft expected to enter the controller's sector of airspace within the forseeable future (which may be some minutes). A detailed inspection of those 'pending' strips will allow a finer grained projection of the developing state of affairs within the sector. The work actually in hand, however, can require the controller's constant and close attention: the amount of traffic and the intricacies of its interaction demanding the controller must be continually 'head's down'. Monitoring the flow of traffic in hand on the radar and through other resources, and managing that flow through interchanges with pilots and other controllers can be so intense that attention cannot be turned away from immediate decision making. During such periods, the work of 'looking out' for expected aircraft and for traffic developments outside but

[5] See Anderson & Sharrock (1987)

potentially consequential for the sector shifts to the 'chief', an individual who oversees the controlling work on the suite, The controller who is submerged in managing the moment by moment flow of traffic cannot engage in planning. It is only when the intensity reduces that the controller can relax attention away immediate controlling. In so doing, the 'pending strips' can be examined and preparations can be made for the foreseeable future situation in which, once again, the controller will be 'heads down' administering the traffic.

In inspecting the 'pending' strips, the controller is on the lookout for possible problems. The utility of the strips is limited by the fact they often provide only information on the scheduled time of arrival of aircraft at relevant navigational points. Aircraft may well fail to materialse on schedule or may indeed turn up earlier than scheduled. Nonetheless, the controller can look for aircraft which are scheduled to arrive at the same navigational location at the same time and requesting the same flight level. Locating such a problem, the controller can consider ways to avoid it. For example, adjoining sectors might be contacted to establish an agreement as to how the problem is to be handled. 'Planning' in air traffic control is concerned with identifying, anticipating, and pre-empting possible problems. It is not the search for solutions to a problem once it has arisen. Planning is inserted into course of work and is affected by the fact that future workload is uncertain.

Strips are not the only resource. The controller is also familiar with the airways making up a sector and knows a great deal about the performance and other technical capabilities of many different aircraft. Using this knowledge, controllers anticipate how traffic will develop and what will need to be done to achieve an orderly and safe flow. Equally, the controller is well aware that "waiting and seeing" is the only way to find out what actual problems will arise. What planning does, then, is contribute to simplifying potential problem situations.

Earlier we made the point that 'planning' and 'rule following' are extremely heterogeneous pursuits. It follows we certainly would not want to suggest the kind of planning involved in the controller's work should be treated as paradigm. What it involves is very different to the planning the Civil Aviation Authority undertakes when designing a new system of air traffic control or the kind of planning involved in the management of an engineering project. But that is our central point. From the standpoint of the situated action approach, determining just how plans relate to actions will depend on the context within which planning is taking place. Planning and implementing an air traffic control system is very different from planning and bringing off the orderly progression of aircraft through a sector. Within the one, the plan might stipulate codified procedures for what may and may not be done. With the other, the plan may be a guide or orientation for action. Neither, we would point out, requires the plan to be a causal condition of action.

CONCLUSION

To non-participants such as ourselves, the "dialogue" between V&S and Suchman seemed pre-destined to end in mutual incomprehension. No way forward was likely to be found unless we could open up some common ground. When arguments relate to alternative standpoints and their implications, we would be extremely unwise to assume that a common vocabulary means a common conceptual framework. Indeed, we might be better to presume precisely the opposite. A good rule of thumb when encountering differences of the kind we have been discussing is to assume disjuncture in frames of reference and hence adopt a principle of interpretive charity while avoiding egological projection. These might just have prevented the misunderstandings and misinterpretations we have described. Rather than starting from the

position that what your opponents say is bizarre, ill thought out and wrongheaded simply because from your point of view it looks to be so, would we not be better to ask what reasons they might have for saying the things they say? It seems to us it is only if we operate with principles such as these that we are likely to get any productive meeting of minds in controversies such as the one over situated action.

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