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## Notes

### 1 Scientists' discourse as a topic

- 1 A systematic exposition based on this literature is provided in Michael Mulkay, *Science and the Sociology of Knowledge*, London: Allen and Unwin, 1979. Some more recent papers can be found in *Knowledge and Controversy: Studies of Modern Natural Science*, a special issue of *Social Studies of Science* edited by H. M. Collins, vol.11, no.1, 1981.
- 2 Virtually all textbooks on social research methods are designed to tell the reader how to obtain the best, single account of the actions which he or she is investigating. This is true even of those texts where great emphasis is placed upon 'going to the people' and letting them speak for themselves. See, for example, R. Bogdan and S. J. Taylor, *Introduction to Qualitative Research Methods*, New York: Wiley, 1975.
- 3 The nature of the analysts' definitive versions of social action is examined in Michael Mulkay, 'Action and belief or scientific discourse? A possible way of ending intellectual vassalage in social studies of science', *Philosophy of the Social Sciences*, vol.11, 1981, pp 163-71.
- 4 John Heritage, 'Aspects of the flexibilities of natural language use: a reply to Phillips', *Sociology*, vol.12, 1978, pp 79-103.
- 5 Marlan Blissett, *Politics in Science*, Boston: Little, Brown and Co, 1972, especially pp 138-43.
- 6 *Ibid.*, p 138.
- 7 *Ibid.*, p 139.
- 8 *Ibid.*, p 141.
- 9 *Ibid.*, p 142.
- 10 G. Nigel Gilbert and Michael Mulkay, 'In search of the action: some methodological problems of qualitative analysis', in *Accounts and Action*, edited by G. Nigel Gilbert and Peter Abell, Aldershot: Gower, 1983.
- 11 Michael Mulkay, Jonathan Potter and Steven Yearley, 'Why an analysis of scientific discourse is needed', in *Science Observed: Contemporary Analytical Perspectives*, edited by Karin Knorr-Cetina and Michael Mulkay, London and Beverly Hills: Sage, 1983.
- 12 M. A. K. Halliday, *Language As Social Semiotic*, London: Edward Arnold, 1978, pp 28-9 and 32.
- 13 Mulkay, 'Action and belief or scientific discourse?'

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- 14 This kind of problem is explored systematically in J. D. Douglas, *Investigative Social Research*, Beverly Hills and London: Sage, 1976.
- 15 For other symbolic domains and their relationship to language, see Nelson Goodman, *Languages of Art*, Brighton: Harvester Press, 1981. We will begin to explore the connections between language and pictorial representation in chapters seven and eight.
- 16 This work is reviewed by Karin Knorr-Cetina, 'The programme of constructivism in science studies: theoretical challenges and empirical results of ethnographies of scientific work', in *Science Observed*, edited by Knorr-Cetina and Mulkay.
- 17 Bruno Latour and Steve Woolgar, *Laboratory Life: The Social Construction of Scientific Facts*, London and Beverly Hills: Sage, 1979, chapter 3.
- 18 Norwood Russell Hanson, *Patterns of Discovery*, Cambridge: Cambridge University Press, 1958; G. Nigel Gilbert and Michael Mulkay, 'Contexts of scientific discourse: social accounting in experimental papers', pp 269-94 in *The Social Process of Scientific Investigation*, edited by K. Knorr *et al.*, Dordrecht/Boston: Reidel, 1980. This paper forms the basis for chapter three below.
- 19 Alfred Schutz, *The Phenomenology of the Social World*, London: Heinemann, 1972.
- 20 H. M. Collins and T. J. Pinch, *Frames of Meaning*, London: Routledge and Kegan Paul, 1982.

- 21 Collins is the most enthusiastic advocate of this kind of approach in the sociology of science. See his 'Respondents' talk and participatory research', a paper given at the University of Surrey Accounts of Action Conference, December 1981. For a general discussion of the craft element in social research, see C. Wright Mills, *The Sociological Imagination*, Oxford: Oxford University Press, 1959.
- 22 G. Nigel Gilbert and Michael Mulkay, 'Warranting scientific belief', *Social Studies of Science*, vol. 12, 1982, pp 383-408; 'Scientists' theory talk', *Canadian Journal of Sociology*, vol.8, 1983, pp 179-97; and 'Opening Pandora's Box', *Sociology of Arts and Sciences*, forthcoming.
- 23 For example, James A. Beckford, 'Accounting for conversion', *British Journal of Sociology*, vol.29, 1978, pp 249-62 and 'Talking of apostasy and "telling" tales' in *Accounts and Action*, edited by G. Nigel Gilbert and Peter Abell, Aldershot: Gower Press, 1983. Jonathan Potter, 'Nothing so practical as a good theory: the problematic application of social psychology', in *Confronting Social Issues: Applications of Social Psychology*, vol. 1, edited by Peter Stringer, London: Academic Press, 1982; Shirley Prendergast and Alan Prout, 'What will I do . . . ? Teenage girls and the construction of motherhood', *Sociological Review*, vol.28, 1980, pp 517-35.
- 24 Detailed discussion of actual instances of these kinds of problem can be found in Jonathan Potter and Michael Mulkay, 'Scientists' interview talk: interviews as a technique for revealing participants' interpretative practices' in *The Research Interview: Uses and Approaches*, edited by M. Brenner *et al.*, London: Academic Press, 1982.

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25 Michael Mulkay and G. Nigel Gilbert, 'What is the ultimate question? Some remarks in defence of the analysis of scientific discourse', *Social Studies of Science*, vol. 12, 1982, pp 309-19.

26 Mulkay, Potter and Yearley, 'Why an analysis of scientific discourse is needed', Steve Woolgar, 'Interest and explanation in the social study of science', *Social Studies of Science*, vol.II, 1981, pp 365-94.

27 We have included in the following list all the studies known to us which contain some form of sociological analysis of scientific discourse, apart from those cited elsewhere in this chapter. D. C. Anderson, 'Some organisational features in the local production of a plausible text', *Philosophy of the Social Sciences*, vol. 8, 1978, pp 113-35; Charles Bazerman, 'What written knowledge does: three examples of academic discourse', *Philosophy of the Social Sciences*, vol. II, 1981, pp 361-87; Charles Bazerman, 'Forces and choices shaping a scientific paper: Arthur H. Compton, physicist as writer of non-fiction', paper presented at the Sixth Annual Meeting of the Society For Social Studies of Science, Atlanta, November 1981; Augustine Brannigan, *The Social Basis of Scientific Discoveries*, Cambridge: Cambridge University Press, 1981; Michel Callon, J. P. Courtial and W. Turner, 'Co-word analysis: a new method for mapping science and technology', mimeo, Universite Louis Pasteur, GFRSULP, Strasbourg; G. Nigel Gilbert, 'Referencing as persuasion', *Social Studies of Science*, vol.7, 1977, pp 113-22; Joseph Gusfield, 'The literary rhetoric of science: comedy and pathos in drinking driver research', *American Sociological Review*, vol.41, 1976, pp 16-34; Karin Knorr-Cetina, *The Manufacture of Knowledge*, Oxford: Pergamon Press, 1981; Bruno Latour and P. Fabbri, 'La rhetorique du discours scientifique', *Actes de la Recherche en Sciences Sociales*, vol.13, 1977, pp 81-95; Michael Lynch, *Art and Artifact in Laboratory Science: A Study of Shop Work and Shop Talk in a Research Laboratory*, London: Routledge and Kegan Paul, 1984; K. L. Morrison, 'Some properties of "telling-order designs" in didactic inquiry', *Philosophy of the Social Sciences*, vol.II, 1981, pp 245-62; Michael Mulkay, 'Norms and ideology in science', *Social Science Information*, vol.15, 1976, pp 637-56; Michael Mulkay, 'Interpretation and the use of rules: the case of the norms of science', pp 111-25 in *Science and Social Structure: A Festschrift for Robert Merton*, edited by Thomas Gieryn, Transactions of the New York Academy of Sciences, series II vol. 39, 1980; Nicholas C. Mullins, 'Paper, forms and groups', paper presented at the Sixth Annual Meeting of the Society for Social Studies of Science, Atlanta, November 1981; Jonathan Potter, P. Stringer and M. Wetherell, *Social Texts and Contexts: Literature and Social Psychology*, London: Routledge and Kegan Paul, 1983; Steve Woolgar, 'Writing an intellectual history of scientific development: the use

of discovery accounts, *Social Studies of science*, vol.6, 1976, pp 395-422; Steve Woolgar, 'Changing perspectives: a chronicle of research development in the sociology of science', in *Sociology of science and Research: Papers of the International Sociology of Science Conference Budapest 1977*, Budapest: Akademiai Kiado, 1979; Steve Woolgar, 'Discovery: logic and sequence in a scientific text', pp 239-68 in *The*

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*Social Process of Scientific Investigation*, Dordrecht/Boston: Riedel, 1980; Steven Yearley, 'Textual persuasion: the role of social accounting in the construction of scientific arguments', *Philosophy of the Social Sciences*, vol. 11, 1981, pp 409-35; Steven Yearley, *Contexts of Evaluation: A Sociological Analysis of Scientific Argumentation with reference to the History of Earth Science*, D. Phil. thesis, University of York, England.

28 Frank Burton and Pat Carlen, *Official Discourse: On Discourse Analysis, Government Publications, Ideology and the State*, London: Routledge and Kegan Paul, 1979.

29 Malcolm Coulthard and Martin Montgomery (eds.), *Studies In Discourse Analysis*, London: Routledge and Kegan Paul, 1981.

30 Peter Roe, *Scientific Text: Selections from the Linguistic Evidence Presented in a Study of Difficulty in Science Text-books*, Discourse Analysis Monographs no.4, English Language Research, Birmingham University, 1977.

31 Once again, this is no more than a difference of emphasis between ourselves and the sociolinguists. For example, Coulthard, Montgomery and Brazil express a similar approach to the structural concepts of sociology when they state that: 'While these factors are quite obviously defined in sociological terms the investigation remained a linguistic one for, while initially it was essential to use concepts like "status", and talk in terms of social roles like "chairman", the hope was that eventually it would be possible to come full circle and define roles like "chairman" as a set of linguistic options.' Coulthard and Montgomery, *Studies in Discourse Analysis*, p 14.

32 David Brazil, 'The place of intonation in a discourse model', pp 146-57 in *Studies in Discourse Analysis*.

## 2 A possible history of the field

1 Our strategy for dealing with interview transcripts corresponds roughly with that advocated by J. Lofland, *Analyzing Social Settings*, Belmont: Wadsworth, 1971.

2 A description of co-citation analysis may be found in Henry Small and Belver C. Griffith, 'The structure of scientific literatures, I and II', *Science Studies*, vol.4, 1974, pp 17-40 and 339-65.

## 3 Contexts of scientific discourse

1 M. A. K. Halliday, *Language As Social Semiotic*, London: Edward Arnold, 1978, p 189 (emphasis added).

## 4 Accounting for error

1 David Silverman, 'Interview talk: bringing off a research instrument', *Sociology*, vol.7, 1973, pp 31-48

2 Crosskey, in passing, seems to be constructing here an incipient account of his own earlier errors in the light of his current view of chemiosmosis. His

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explanatory resource is the notion of 'dogmatism', which occurs in many of our examples.

- 3 Melvin Pollner, 'Mundane reasoning', *Philosophy of the Social Sciences*, vol.4, 1974, pp 35-54.
- 4 Ibid., p 39.
- 5 Ibid., p 48 (italics in the original).

## 5 The truth will out

- 1 H. Sacks, E. Schegloff and G. Jefferson, 'A simplest systematics for the organisation of turn-taking for conversation', *Language*, 1974, pp 696-735.
- 2 Bruno Latour and Steve Woolgar, *Laboratory Life*, Beverly Hills and London: Sage, 1979.

## 6 Constructing and deconstructing consensus

- 1 This issue is discussed in more general terms in *Advances in Social Theory and Methodology: Toward an Integration of Micro and Macrosociologies*, edited by K. Knorr-Cetina and A. Cicourel, London: Routledge, 1982.
- 2 In order to safeguard participants' anonymity as far as possible, we will not provide references for the published sources used in this chapter.
- 3 John Ziman, *Public Knowledge: The Social Dimension of Science*, Cambridge: Cambridge University Press, 1968, p 9.
- 4 Karin D. Knorr, 'The nature of scientific consensus and the case of the social sciences', pp 227-56 in *Determinants and Controls of Scientific Development*, edited by K. Knorr *et al.*, Dordrecht: Reidel, 1975, pp 252-3 (italics in the original).
- 5 Ibid., p 242.
- 6 For a detailed study of how scientists reach agreement informally, see Michael Lynch, *Art and Artifact in Laboratory Science: A Study of shop Work and Shop Talk in a Research Laboratory*, London: Routledge and Kegan Paul, 1984.
- 7 For a discussion of some of scientists' folk theories, see Augustine Brannigan, *The Social Basis of Scientific Discoveries*, Cambridge: Cambridge University Press, 1981.
- 8 These recurrent features are not, of course, observable apart from the interpretative work carried out by ourselves as analysts or by some other hearers or readers. However, we have shown that the interpretative procedures which we have identified are significant elements in participants' discourse by documenting how they become the focus of participants' own efforts at interpretative deconstruction.
- 9 See Michael Mulkay, 'Consensus in science', *Social Science Information*, vol.17, 1978, pp 107-22.

## 7 Working conceptual hallucinations

- 1 Robert A. Day, *How to Write and Publish a Scientific Paper*. Philadelphia: ISI Press, 1979.

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- 2 J. B. Finean, R. Coleman and R. H. Michell, *Membranes and their Cellular Functions*, Oxford: Blackwell, 1978.
- 3 Martin J. S. Rudwick, 'The emergence of a visual language for geological science 1760-1840', *History of Science*, vol.14, 1976, pp 149-95.
- 4 Jerome R. Ravetz, *Scientific Knowledge and its Social Problems*, Oxford: Clarendon Press, 1971.
- 5 This is, of course, a pseudonym. For the same reason as before we provide no specific reference.

- 6 Finean *et al.*, *Membranes and their cellular functions*, p 90.  
 7 *Ibid.*, p 73.  
 8 For other examples of visual jokes in a textbook, see David G. Nicholls, *Bioenergetics: An Introduction to the Chemiosmotic Theory*, London and New York: Academic Press, 1982. The use of 'unrealistic' components in textbook cartoons is not rigidly restricted to the representation of phenomena which are defined as 'not yet understood'. Such components can also be used to represent phenomena which are treated as 'not directly relevant to' the topic in question; even though these phenomena are taken to be well understood and as amenable, in principle, to much more 'realistic' representation in appropriate circumstances.

## 8 Joking apart

- 1 See for example the articles in *Impact of Science on Society*, vol.19, no.3, 1969, which is devoted entirely to scientists' humour.
- 2 *Hopkins and Biochemistry*, Cambridge: Heffer and Sons, 1949.
- 3 E. Garfield, 'Humour in scientific journals, and journals of scientific humour', *Essays of an Information Scientist*, vol.2, Philadelphia: ISI Press, 1977, pp 664-71.
- 4 I. J. Good *et al* (eds.), *The Scientist Speculates*, New York: Basic Books, 1962; *A Random Walk in Science*, an anthology of scientists' humour compiled by R. L. Weber, London and Bristol: the Institute of Physics and New York: Crane, Russak, 1973.
- 5 Sidney Harris, *What's So Funny About Science?*, Los Altos, California: William Kaufmann, 1980.
- 6 Harold Baum, *The Biochemists' Songbook*, Oxford and New York: Pergamon Press, 1982.
- 7 Two of the very few analysts to treat scientific humour as a fruitful topic are Martin J. S. Rudwick, 'Caricature as a source for the history of science: De La Beche's anti-Lyellian sketches of 1831', *Isis*, vol.66, 1975, pp 534-60 and G. D. L. Travis, 'On the construction of creativity: the "memory transfer" phenomenon and the importance of being earnest', pp 165-93 in *The Social Process of Scientific Investigation*, edited by K. Knorr *et al*, Dordrecht and Boston: Reidel, 1980.
- 8 John Allen Paulos, *Mathematics and Humour*, Chicago and London: The University of Chicago Press, 1980, p 9.
- 9 An attempt to develop a sociological analysis of irony can be found in Edmund Wright, 'Sociology and the irony model', *Sociology*, vol.12, 1978, pp 523-43.

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- 10 For a detailed examination of the place of laughter in certain passages of discourse, see Gail Jefferson, 'A technique for inviting laughter and its subsequent acceptance/declination', pp 79-95 in *Everyday Language: Studies in Ethnomethodology*, edited by G. Psathas, New York: Irvington, 1979.
- 11 Good, *The Scientist Speculates*, pp 52-3; also in Weber, *A Random Walk in Science*, pp 120-1.
- 12 Weber, *A Random Walk in Science*, p 140.
- 13 *Ibid.*, pp 167-8.
- 14 Sally MacIntyre, "'Who wants babies?'" The social construction of "instincts" ', pp 150-73 in *Sexual Divisions and Society*, edited by Diana Barker and Sheila Allen, London: Tavistock, 1976.
- 15 *Ibid.*, p 159.
- 16 *Ibid.*, pp 159-60.

## 9 Pandora's bequest

- 1 For analyses of multiple realities, see Erving Goffman, *Frame Analysis: an Essay on the*

*Organisation of Experience*, New York: Harper and Row, 1974; Melvin Pollner, 'The very coinage of your brain: the anatomy of reality disjunctures', *Philosophy of the Social Sciences*, vol.5, 1975, pp 411-30; Dorothy Smith, 'K is mentally ill: the anatomy of a factual account', *Sociology*, vol.12, 1978, 23-53; E. C. Cuff, *Some Issues in Studying the Problem of Versions in Everyday Situations*, Occasional paper no.3, Department of Sociology, University of Manchester, 1980; Alfred Schutz, *The Phenomenology of the Social World*, London: Heinemann, 1972.

- 2 For example, Jack D. Douglas, *The Social Meanings of Suicide*, Princeton: Princeton University Press, 1967; *Understanding Everyday Life*, edited by Jack D. Douglas, London: Routledge and Kegan Paul, 1971. In so far as scientific discovery is a collective phenomenon, two previous contributions which point towards our form of analysis of collective phenomena are Steve Woolgar, 'Writing an intellectual history of scientific development: the use of discovery accounts', *Social Studies of Science*, vol.6, 1976, pp 395-422 and Augustine Brannigan, *The Social Basis of Scientific Discoveries*, Cambridge: Cambridge University Press, 1981.
- 3 For this kind of reformulation of the central concern of the sociology of knowledge, see Michael Mulkay, *Science and the Sociology of Knowledge*, London: Allen and Unwin, 1979, p 93.
- 4 For examples of related work on discourse in disciplines other than sociology, see the references to chapter one. See also *Interspreting: Interpreting Dickens' 'Dombey'*, Baltimore: John Hopkins University Press, 1979; J. V. Harari (ed.), *Textual Strategies: Essays in Post-Structuralist Criticism*, London: Methuen, 1979; R. Fowler, *Literature as Social Discourse: The Practice of Linguistic Criticism*, London: Batsford Academic, 1981; J. Culler, *The Pursuit of Signs: Semiotics, Literature and Deconstruction*, London: Routledge, 1981; S. Hall, D. Hobson, A. Lowe and D.

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Willis, *Culture, Media, Language*, London: Hutchinson, 1980; R. Fowler, B. Hodge, G. Kress and G. Trew, *Language and Control*, London: Routledge, 1979; J. Potter, P. Stringer and M. Wetherell, *Social Texts and Contexts: Literature and Social Psychology*, London: Routledge, 1983.