The aim of this paper is to question the assumptions underlying research into architectural technology. It begins with a summary of my perspective of the present role of research, before moving onto a critique of the scientific basis of much of this research. It concludes with one suggestion for re-establishing a redemptive role for technology in architecture.

The relationship between architectural practice and education is one that is usually fraught with tension. Typically, the profession complains that the schools are not producing students trained in the basic skills. For their part, the schools suggest that the profession does not support their effort in developing an architecture that goes beyond strict pragmatic or functional requirements. The debate between the two polarises to the ends of training and education - the profession looking to the schools to train, the schools insisting on their responsibility to educate.

It is interesting therefore to note that more of a consensus is reached in the fields of research and technology. In research, an attempt is made to establish a connection between the schools and the profession. An instrumental link is established whereby the theory developed through research guides the concrete actions of practice. For its part, technology is treated as the application of scientific principles to solve problems in the building process. The useful role that the schools are seen to provide is in the research and teaching of these scientific principles. The profession finds a certain comfort in the objective realm suggested by these approaches to research and technology, where hard scientific facts are given greater legitimacy than the intuitive, subjective feelings of the designer. This has two results. First, the profession tends to limit its control over education to these technical-rational areas, ignoring the wider and more complex discourse of the cultural dimensions of architecture and its education. Second, technology teaching becomes detached from studio design, being treated not as an education but as a training in which students are given normative responses to typical conditions.

This scientific based model for research and technology is further encouraged by the actions of the various research grant councils which tend to support project based on testable, finite results rather than the type of open-ended theorising that is demanded in designing. With twin pressures from the profession and research councils, it is therefore hardly surprising that research into architectural technology is weighted towards scientific methodology and equally that most design research orientated towards the pseudo-sciences of morphologies, typologies and sociologies.

Scientific research into architectural technology neatly fits into the Cartesian framework of knowledge which dominates the modern world. This framework demands a definite analytical methodology for those working within it, a method that traditionally denies the realm of intuition and imagination. We are therefore presented with a model of the world filtered through one lens to the exclusion of others, namely the lens of objectivity. For the scientific researcher this leads to a form of myopia in which the search for immutable laws and theories takes precedence over other values. In architecture this search for the immutable is particularly short-sighted given the contingent nature of our discipline where buildings are subject to a whole series of unpredictable forces and conditions. It is apparent that concentration on scientific aspects of research is at best limiting and at worst positively dangerous in the development of architecture.

And yet, we proceed in a determinist manner, lulled by a sense of security which comes, as Gaston Bachelard puts it "from a feeling that a fundamental order exists, a feeling of intellectual repose stemming from the symmetries and certainties inherent in mathematical analysis".[1] Bachelard, a scientist by education, brings his phenomenological critique to deterministic methodology, as he later brings a phenomenological understanding to architecture in Poetics of Space. He argues that the determinist method of working is by its very nature reductive and also self-legitimating. "If the phenomenological level were restored it would become apparent that any systems that we assumed to be deterministic are so only to a limited degree....it becomes apparent that determinism is a product of selection and abstraction."[2] Furthermore, and particularly interesting in the light of this conference, Bachelard argues that determinism has developed its own pedagogical technique.[3]

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1 Gaston Bachelard, *The New Scientific Spirit* (Boston: Beacon Press, 1984), 102.

2 Ibid., 104.

3 Ibid., 107.

We are therefore faced with a situation whereby the scientific concentration on research circumscribes the very way in which we teach architecture. To break free from this, Bachelard proposes what he calls a non-Cartesian epistemology, which will act as a challenge to simple and absolute laws. He also urges us to accept the fundamental duality in our thinking, whereby intuition and study are seen together.[4] He finds both these qualities in the new quantum physics that were developing when he was writing The New Scientific Spirit in 1930, but we would be hard pressed to find them in the research departments of architectural schools. Whilst such a non-cartesian methodology may in fact be difficult to apply the more basic empirical research conducted in architecture, it is important to heed Bachelard's warning of the intellectual repose which comes from containing research within the confines of the Cartesian framework

I now wish to move from a critique of research methods to the wider effects that those methods have had. The grip of the Cartesian framework is such that it blinds us to a simple truth, namely that science does not have the sole access to reality. Despite this, it is clear that the model of the natural sciences has dominated our thinking since the C18. One effect of this domination has been to limit the areas study that are considered legitimate, with the 'hard' issues of epistemology & science assuming greater currency than the softer concerns of morality, ethics and culture.[5]

As Richard Rorty notes in *Philosophy and the Mirror of Nature*, the area under analysis is circumscribed by the very method of analysis, resulting in a mirroring effect.[6] The traditional task of philosophy, in attempting to find the ultimate foundation of knowledge, has been to polish the mirror. We can see how a self-legitimating self-defining circle is set up. In architecture this circle is apparent in the way that theory developed in research establishments becomes the basis for practice which in turn becomes the basis for research. The polishing of the mirror comes in the self-reflexive matching of practice to theory, an activity encouraged by the research councils in their desire to match funds with results. The result is a limited definition of architecture, one that is filtered through a technical-rational framework, and one denies a wider cultural basis. Such a definition demands a particular approach to teaching, with an emphasis on the accumulation of facts, data and certain procedures.

Rorty opposes this epistemological model with a hermeneutic one.[7] He draws on the work of Hans-Georg Gadamer, in which the limitations of objectivity are recognised. Gadamer argues that education be seen not merely as the acquisition of facts, but as a way to realise how those facts may affect the way that we live.[8] This is not to dismiss the search for objective knowledge as irrelevant, but to acknowledge that it is but one human project among many. Rorty ends his book with a plea for philosophy to look beyond its self-defined epistemological horizons and to enter into what he calls the conversation of mankind.

This call could well be applied to technology, which has developed its own autonomy but with far more invasive effects than the autonomy of philosophy. The image of technology as the neutral application of scientific principles in the name of progress and human emancipation is often accepted as the paradigm. Technology seduces us with the siren of progress for progress' sake. Despite previous warnings, it is only now, when faced with impending ecological disaster, that we are beginning to see the full dangers of this seduction. The warnings have centred on the way technology has moved from being a benign agent of change to one which invades aspects of society. In the same way that the daemon created by Dr. Frankenstein the name of progress ends up destroying his creator, so technology has overwhelmed humanity. As Gadamer comments, the old image of technology serving the needs of society has been reversed so that what has been artificially produced now sets the terms of existence. In Reason in the Age of Science he writes: "Here lies the greatest danger under which our civilisation stands, the elevation adaptive qualities to privileged status".[9] Technology, once a means to an end, has become an end in itself.

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4 Ibid., 141.

5 See Richard J. Bernstein, *Beyond Objectivism and Relativism* (Oxford: Blackwell, 1983), 47.

6 Richard Rorty, *Philosophy and the Mirror of Nature* (Princeton: Princeton University Press, 1979).

7 Ibid., Chapter 7.

8 Hans Georg Gadamer, *Truth and Method* (New York: Seabury Press, 1975), Chapter 1, *The Significance of the Humanist Tradition*.

9 Hans-Georg Gadamer, *Reason in the Age of Science*, trans. Frederick G. Lawrence (Cambridge, Mass: MIT Press, 1981), 73.

This situation is reflected in the glass of hi-tech architecture. Here the selection and development of technological materials in the spirit of the age, or better still the age to come, is seen as sufficient justification for the architecture. Aldo van Eyck reminds us this is little more than a nostalgia for the future, the counterpart of which is the historicist's nostalgia for the past. Both nostalgias ignore the condition of the present, and so have no answers to our current crisis. When criticised on, say, environmental or economic grounds, the answer of these hi-tech architects is not to question the basis of their work, but to solve a problem of technology with more technology. Witness the predicament of Dominique Perrault, architect of the proposed new Biblioteque Nationale in Paris. When its is pointed that books will wilt in his vertical greenhouses, the response is to confound the critics with more and more technological solutions, not to question why use glass in the first place. Such is the power of autonomous technology that it blinds us to the wider goals that architecture should address.

Faced with the dominance of technology, there are two common responses.[10] One is of despair, claiming that technology has its own inexorable logic which, once set up, we cannot escape. The other is of Luddite retreat into a pre-technological era. There may, however, be an alternative view which is more positive than these options. I have already suggested the necessity of breaking from the intellectual repose of Cartesian methodology and to move beyond the sealed system of scientific epistemology. An important part of this move is to recognise that research is not ideologically neutral, but is politically and ethically loaded. As Jurgen Habermas argues, this can only occur if scientists acknowledge the explicit connection between their knowledge and practical interest. "Science", he writes "can gain power by acknowledging its dependence on human interest and turning against its own illusion of pure theory".[11] This argument is equally applicable to the realm of architectural research into technology, demanding as it does the move from pure objectivity into the recognition of the wider cultural context in which architecture is situated.

In summary, I wish to draw on Habermas' seminal essays contained in *Towards Rational Society*.[12] Here he argues that the technocracy in which we live has suppressed any communicative action orientated towards shared cultural meaning, has repressed ethics as a legitimate category for discourse and has resulted in political domination. Commenting on technology's control of the political realm, he writes that: "politics takes on a peculiarly negative character. For it is orientated towards the elimination and avoidance of risks that threaten the system; not in other words towards the realisation of practical goals but the solution of technical problems."[13]

This view that has equal strength when the word *politics* is replaced with *architecture*: "architecture takes on a peculiarly negative character. For it is orientated towards the elimination and avoidance of risks that threaten the system; not in other words towards the realisation of practical goals but the solution of technical problems." It summarises the dilemma that I have outlined above, in which architecture is seen as no more than the solution of technical problems and, in these days of insurance claims, is indeed often oriented towards risk limitation.

Habermas suggests that the solution to this dilemma is not to ignore the technical dimension, but to translate technically exploitable knowledge into what he calls "the consciousness of the social life-world.''[14] The lessons of this for architecture and its use of technology are clear. Only by critically recognising the dominance of the technological model can we move into a situation whereby technology can again have a redemptive role, where it serves to reveal a set of wider issues rather than concealing its own dominant ideology under a veneer of progress. Only by acknowledging the political, ecological and ethical dimensions of each and every project can we escape the siren calls of progress and technology-as-an-end-in-itself. Away from the demands of both teaching and practice, architectural research has a unique position, and therefore responsibility to instigate the kind of critical

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10 Richard J. Bernstein, *The Restructuring of Social and Political Theory* (Oxford: Blackwell, 1976), 176.

11 Jürgen Habermas, *Knowledge and Human Interests* (London: Heinemann, 1972), 310.

12 Jürgen Habermas, *Towards a Rational Society*, trans. J. J. Shapiro (Boston: Beacon Press, 1970). The essays are Technical Progress and the Social Life-World and Technology and Science as Ideology.

13 Ibid., 102.

14 Ibid., 152.

thinking that Habermas calls for. Such thinking should then have a direct effect on both teaching and practice. Its aim should be the harnessing of technology to the ends of architecture.- architecture as the mediation between humans and social life-world. In teaching it implies that technology is not seen as a separate instrumental discipline to do with problem solving. Rather it should be treated as an integral part of the design course, and taught as a medium to be used in the revealing of ideas. Only then can architecture re-establish its pivotal position in Rorty's conversation of mankind.