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Articles

The Emergence of E-Scaped Medicine?

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ABSTRACT

This article asks the question, is it possible to decipher a new 'medical cosmology' that possesses an elective affinity with contemporary socio-technological changes? It tentatively answers in the positive and attempts to identify the parameters of a new medical cosmology that it terms *e-scaped medicine*. To discern the conceptual underpinnings of *e-scaped medicine* the article draws on De Mul's theorization of the 'informatization of the worldview'. The article elaborates on this thesis in relation to medicine's prime object – the body – and to a number of medical practices that surround it.

KEY WORDS

bodies / ICTs / information / medical knowledge

Introduction

I n 1976 Jewson published an article in this journal called 'The Disappearance of the Sick Man from Medical Cosmology, 1770–1870'. The article not only became a much cited 'classic' in medical sociology but it also represents a particularly good example of a sociological tradition concerned to periodize different discursive formations and the manner in which they form 'elective affinities' (Thomas, 1985) with broader material changes. Jewson pointed to the historically and socially contingent nature of medical knowledge and demonstrated how different episodes articulated with broader socio-technological changes. Working at a similar level of abstraction to Jewson – one that facilitates an appreciation of what have variously been termed medical 'frames of reference', 'discursive formations', 'cosmologies', 'paradigms', 'problematics', 'spatializations' and so on – this article aims to build upon this

tradition by speculating upon the manner in which contemporary medical discourses are changing in concert with contemporary patterns of social and technological change.

This article asks whether it is possible to decipher a new 'medical cosmology' that possesses an elective affinity with contemporary socio-technological changes. We answer tentatively in the positive, and attempt to characterize a medical cosmology as encapsulated in the emergence of what we term *e-scaped medicine*. In order to do this, we first review Jewson's notion of medical cosmology. We then draw on the work of the philosopher De Mul (1999), who argues that our contemporary 'worldview' is characterized by what he calls 'informatization'. This resonates with Webster's (2002) contention that today modern medicine can be usefully thought of as 'information'. We elaborate on his thesis in relation to medicine's prime object – the body – and a number of medical practices that surround it. Having considered the informatization of medicine, we outline the contours of a new medical cosmology, which we map on to Jewson's original model.

Medical Cosmologies

For Jewson, medical cosmologies are:

> … conceptual structures which constitute the frame of reference within which all questions are posed and all answers are offered. Such intellectual gestalt provides those sets of axioms and assumptions which guide the interests, perceptions, and cognitive processes of medical investigators. (Jewson, 1976: 225–6)

Defining medical cosmologies in this way, Jewson is able to identify three types which are linked to the social organization of medical practice. The first cosmology, from the 1770s to 1800s, was *bedside medicine* wherein the doctor had a close interpersonal relationship with his or her client who, being the doctor's patron, exerted considerable influence on the doctor's theories of disease. Medical knowledge tended to be heterogeneous as doctors developed their own styles to suit their paying clients. The second cosmology, from the 1800s to the 1840s, was *hospital medicine* wherein patients were located in the hospital. Here, doctors rather than patients took charge, and a coherent theory of disease based on the localization of pathology was developed. Finally, from the 1840s to the 1870s, medical knowledge was developed within *laboratory medicine* wherein scientists controlled the mode of knowledge production. Progress in physiology was critical in this period, and the origins of diseases were to be understood primarily in terms of cellular processes rather than anatomical science. Thus medical practice became 'an appendage to the laboratory' (Jewson, 1976: 230). Jewson reveals that those who control its means of production have influenced the content of medical knowledge; this control has shifted from the patient to the hospital doctor, and then to the medical scientist.

Whilst Jewson's work is predominantly materialist, another commentator, Armstrong (1995), adopting a Foucauldian approach, suggests that a further form of medicine emerged during the early 20th century – namely *surveillance medicine*. Within this configuration of medical discourse, medical scientists not only study the physical anatomy but also analyse the distribution of disease, illness and health of populations. Whilst Jewson had argued that the patient had 'disappeared' from medical discourse within laboratory medicine, within surveillance medicine the patient – and the potential patient – reappears with a new (risk) identity. Armstrong, however, talks not of a new form of medical cosmology, but rather, after Foucault (1973), he uses the idea of 'spatialization'. Fundamentally, both Jewson and Armstrong are describing shifts in the way medical knowledge is configured and sustained – they describe transformations in the ways medicine conceives, constructs and describes its objects of study. These transformations are associated with social relations and technological forms. The moves from bedside to hospital, from hospital to laboratory, and from the microanalysis of bodily components to the analysis of epidemiological data derived from the community, are associated with differential technological forms and materials. The stethoscope, the microscope, and statistical technologies increasingly developed with the aid of computers, have thus all been privileged within different cosmologies. Perhaps today networked computer systems could be seen as the privileged technological form which impacts on the capacity not simply to process data but also to influence our ways of thinking – or our 'intellectual gestalt' – to use the terminology adopted by Jewson. Certainly, this is the view of De Mul (1999) whose argument provides a useful starting point for our own analysis.

Mechanistic and Informationistic World Views

In his article 'The Informatization of the Worldview' De Mul (1999) takes Dijksterhuis's (1986[1950]) book *The Mechanization of the World Picture* as his point of departure. Dijksterhuis's thesis is that during the 16th and 17th centuries developments in the natural, human and cultural sciences resembled those in the development of mechanics. Scientific method and cultural analysis shared certain assumptions and postulates: the physical universe could be understood as a great machine, the workings of which can be deciphered and understood, predicted and controlled. Thus De Mul suggests that 'the mechanistic world view' is characterized by the three postulates of *analysability*, *lawfulness* and *controllability*. The notion of *analysability* implies that objects, things, machines, bodies and so on can be analysed as a collection of elements or parts that are separate from one another, but are also interdependent. The analysis of elements and the extent to which the outcome of the interaction of things can be predicted leads, of course, to the identification of laws (*lawfulness*) – most readily seen in Newtonian physics. If things can be predicted and 'laws' applied, then the logical outcome is that they may be *controlled*.

It is well recognized that this view formed the basis of sociology in the 19th century – the three postulates are evident in early positivistic social research. It was evident too in 'modern' empirical medicine; within anatomical sciences, which were privileged in *hospital medicine,* and then within physiological science, which formed the basis of *laboratory medicine*. The principles and techniques of physics were used to support the work of the physiologists. Once they could be rid of the biological notions of vitalism (the idea that organisms can only be understood in terms of their life-giving quality) the 19th-century scientists could search for the smallest units of analysis. As Jewson (1976: 232) notes, by the mid-19th century:

> Living organisms and their ailments are conceptualised as law-like combinations of non-living elements and substances, life and death as physico-chemical processes. The study of life is replaced by the study of organic matter.

Thus the mechanistic worldview resonates throughout the hospital and laboratory medical cosmologies described by Jewson (see also Birke, 1999; Martin, 1989).

More significantly for our argument here is the formation of an alternative view. As De Mul (1999: 74) writes:

> What I wish to clarify is the manner in which the concept of 'information', and the information technology linked to it, affect the way we perceive, evaluate and respond to the world – in short our *worldview*.

For De Mul, the *informationistic worldview* is characterized by the following postulates: *synthetizability*, *programmability* and *manipulability*. Hence the physical universe is conceptualized as an information-processing machine, and physical, chemical and biological systems are seen as information-processing systems. For example, the human brain is still subject to analysis – as in the mechanistic worldview – but what is different now is that the elements of the brain are not merely viewed as a collection of separate elements which function interdependently, but the whole may become something more complex and different to the sum of its parts. This is what De Mul intends by the *postulate of synthetizability*. The salience of this paradigm shift has been articulated by other theorists, sometimes denoted by way of reference to terms such as chaos or complexity theory (Byrne, 1998). One of the clearest articulations has been by De Landa (1993), who views the new paradigm as one based upon what he terms 'non-linear dynamics'. For De Landa this means that the future of scientific inquiry will be based around explorations of virtual environments. He writes:

> Tapping the potential of the 'epistemological reservoir' constituted by virtual environments requires that many old philosophical doctrines be eradicated. Essentialism, reductionism, and formalism are the first ones that need go. Our intellectual habit of thinking linearly, whereby the interaction of different causes is seen as additive – and so global properties that are more than the sum of the parts are not a possibility – also needs to be eliminated. (1993: 811)

This new paradigm – evident in both the natural and social sciences – has been popularized in books such as *Emergence* (Johnson, 2001). 'Emergence', 'complexity', 'non-linear dynamics' or 'chaos' theory – call it what you will, took hold, Johnson argues, in the mid-1980s with the establishment of the Sante Fe Institute and Gleick's book on *Chaos* (1987). The roots of these ideas came much earlier and are associated with the disciplines of information theory, cybernetics, and systems theory, but what these disciplines had in common was their reliance on computers both to process huge quantities of information and to create simulations or virtual environments.

De Mul points out that within the mechanical worldview much effort was directed towards seeing how things functioned so that they could be predicted and controlled. By contrast, the contemporary emphasis is to try to imitate 'reality' by way of computer programs. This is the *postulate of programmability*; here:

> … explanation no longer means the linking of atomic elements with the aid of laws, but being able to write a computer program that results in a simulation of the object to be explained ... being able to construct a simulation adequately explains the phenomena. (De Mul, 1999: 85–6)

Explanations, for example mathematical explanations, are not couched in the language of mechanics but rather in the language of computer science, which describes the transfer of information. Prediction and control of events are not explained in terms of laws, rather the laws themselves come to be subject to manipulation. Rather than describing what is, the *postulate of manipulability* refers to the attempt to simulate laws and potentially alter them.

In sum, De Mul argues that the advent of the new information and communication technologies (ICTs) means more than just the material reality of computers. Developments in these technologies alter our perception and interpretation of reality. This is apparent in the 'new science' of complexity, which argues that an empiricism which rests on the assumptions of reductionism and analysibility has had its day. Crudely, the new ways of thinking require that old assumptions associated with mechanistic thinking must be purged. Johnson (2001) captures these ideas neatly by using the metaphor of the 'pacemaker'. He cites research findings on slime mould and ants to illustrate his case. In the case of the former, he refers to the work of Fox Keller and her colleagues who challenged the assumptions of biologists who believed that slime mould formed at the command of founder cells when she argued that the 'community' of slime mould cells were actually organizing themselves. Fox Keller recalls that when she gave seminars to biologists they would say 'Where's the founder cell? Where's the pacemaker?' They found it difficult, she says 'to think in terms of collective phenomena' (cited in Johnson, 2001: 16). The idea of getting rid of the pacemaker is not of course limited to the biological and physical sciences. What Fox Keller saw:

> … in the slime mould assemblages; Jane Jacobs saw … in the formation of city neighbourhoods; Marvin Minsky in the distributed networks of the human brain.

What do all these systems share? In the simplest terms, they solve problems by drawing on masses of relatively stupid elements, rather than a single, intelligent 'executive branch'. They are bottom-up systems, not top down. They get their smarts from below. In a more technical language, they are complex adaptive systems that display emergent behaviour. (Johnson, 2001: 18)[1]

These ideas resonate with some influential approaches in the social sciences. We may recall how Foucault (1979) advised that we must 'kill the king' (as it were) and appreciate that sovereign power has been displaced by disciplinary power; power that comes from below, the view that bodies were not subjugated as such but have their own inherent forms of bio-power and resistance. If biologists found the idea of cells or ants being self-organizing difficult to comprehend, so too did some sociologists when it came to understanding such a radical new way of comprehending social processes. But this is not the main point here. The argument is that there are new ways of thinking – a new 'order of things' – which is pervaded by the concept and metaphor of *information*.

As we noted in our introduction, Webster (2002) has articulated the view that we might usefully begin to think of medicine as 'information'. Certainly, as he observes, biology is becoming an information science, mapping information at the level of cells, proteins and genes. Medicine more generally is becoming information-based in terms of its delivery and management. It is also the case that diagnosis, clinical decision-making and practitioner–patient communication are being affected by the nature of information that derives from assessments of medical interventions and/or assessments of risk of various sorts. Some of the main contrasts between what we might crudely term 'mechanical' medicine and 'informational' medicine are schematized in Table 1 and are discussed in more detail below.

Informational Bodies

A number of writers (Birke, 1999; Fox Keller, 1995; Haraway, 1991; Martin, 1994) concur that information is '*the* prominent motif in modern biology'

Table 1   From mechanical medicine to informational medicine

'Mechanical' medicine	'Informational' medicine
Body as a machine	Cyborg
Disease – pathological lesion	Disease – communications break down
Insides of body seen by surgeons	Insides of body seen by all e.g. on the internet
Medical knowledge	Medical information
Art of medicine	Evidence-based medicine
Learning by rote	Problem-based learning
Patients have lay beliefs	Patients produce health knowledge
Doctors manage disease	Expert patients manage illness

(Birke, 1999, emphasis in original). For example, Haraway interrogates texts on the immune system to reveal how the system has been reconceptualized from a system which was 'led' by T cells to one which is self-organizing – rather than being orchestrated by a conductor as a coherent system, it functions as a cacophony. There is no pacemaker. She argues that the 'hierarchical, localised organic body' that was privileged in the early part of the 20th century has been dislodged. The idea that the mechanical model of the body has been overlain by an alternative model is clearly evident in contemporary anthropological and discursive explorations of the body. For example, Martin's (1994) influential anthropological study of conceptualizations of the body and the immune system in the USA reveals that 'complex systems models' provide a pervasive way of thinking about our bodies *and* our societies. Having interrogated the discourse of immunologists, she found that military metaphors were used to describe the immune system. However, such metaphors, it seems, are no longer applicable, relying as they do on old style models of warfare – wherein territories have to be defended, boundaries are clearly demarcated and enemies are known. Martin cites the work of Jerne, an influential immunologist who wrote in 1974 that the immune system is conceived:

> as a network of communicating cells that can learn from and adapt to experience … it … is largely (98%) made up of small lymphocaytes that can respond to an enormous variety of signals. Unlike the nervous system, they do not need to be connected by fibres because they can move freely about the body, interacting by direct encounter or by the antibody modules that they release. (Martin, 1994: 109–10)

To capture its incredible information capacity and its ability to adapt to alterations in the environment, the immune system has been referred to as 'a mobile brain' (Martin, 1994: 110). The boundary between the body and its environment becomes blurred – there is a continuous interplay between the two.

Levin and Soloman's (1990) analysis of 'discursive formations of the body' also concurs with the idea that alongside the mechanistic model of the body there is an alternative (what they call 'post modern') discourse which is informed by 'systems-theoretical thinking' and 'information processing categories'. Perhaps the most well-known example which typifies the 'body as a machine' metaphor is Harvey's 'discovery' of blood circulation with the heart as the pump. More recently, the heart is also considered to be an endocrine organ producing hormones which influence other functions – thus 'the heart has been accepted as a "communicator" as well as a pump' (Levin and Soloman, 1990: 522–3). Their agenda is a prescriptive one in that they are arguing for a systems approach and outline the promise offered by pursuing such a research route in the field of psycho-neuroimmunology, which analyses the interactive effects of brain cells and immune cells with 'experience' (Levin and Soloman, 1990: 531). Their view is that contemporary analysis which appreciates the interaction of interior and exterior systems offers a unique way forward to facilitate the integration of lived experience and

physical functioning. For the purposes of this article, whether or not they are correct is not the point. What is salient is the fact that they articulate the body in this way.

Summarizing these views, Haraway argues that the body:

> ceases to be a stable spatial map of normalised functions and instead emerges as a highly mobile field of strategic differences. The biomedical-biotechnical body is a somatic system, a complex meaning-producing field, for which the discourse of immunology, that is, the central biomedical discourse on recognition/misrecognition, has become a high-stakes practice in many senses. (1991: 211)

Together with this, she suggests that disease becomes a form of information malfunction or a 'communication pathology'; accordingly the prime pathology is stress – communications breakdown – which depresses the immune system.

The information metaphor is not exclusive to conceptualizations of the immune system, but pervades other aspects of biology. In her book, *Refiguring Life*, Evelyn Fox Keller (of slime mould fame) reflects on the ways in which the computing and information sciences and the biological sciences have influenced one another. As a result she argues:

> It is not only that we now have different ways of talking about the body (for example, as a computer, an information-processing network, or a multiple input-multiple output transducer) [see following] but that, because of the advent of the modern computer (and other new technologies), we now have dramatically new ways of experiencing that body. (Fox Keller, 1995: xvii)

Of course it is within molecular biology and genetics that the information metaphor is the most readily obvious. This, Fox Keller notes, was ironic, because in the 1950s when geneticists spoke of DNA carrying genetic information they understood this to function as a linear code. When Francis Crick spoke about the Central Dogma in the late 1950s, he communicated the idea of DNA functioning as a one-way linear structure – providing 'instructions' to proteins, rather like a pacemaker. Molecular biology, at that time, thus worked within a mechanistic paradigm. Cyberscience and the new genetics of molecular biology may have occurred at the same historical moment, as Fox Keller (1995: 85–98) points out, but they developed in parallel: they were on 'twin tracks'. But this could not last. By the 1970s, the 'new science' took hold and molecular biology (which was inherently mechanistic) had to concede to theories which were being articulated in developmental biology (which was inherently informational), in order to accept that genes could not provide the blueprint, or the instructions for development. The whole organism had to be taken into account. This was not the whole 'vital' organism of the 'old biology' but a new one which did not just passively receive information; it would process it and react to it, and thus create new forms of life. Furthermore, the networks of messages and information flowed in, out and through bodies and machines; the distinction between bodies and machines was also blurring – their parts were interchangeable.

Within the informatization worldview the body became what Wiener in his book on Cybernetics called 'a multiple-input, multiple-output transducer' (1948: 31–2). Rather than a bounded organism it was an unbounded and flexible system. For example, the boundary between bodies and machines has become blurred, hence the notion of the cyborg – 'a cybernetic organism, a hybrid machine and organism' (Haraway, 1991: 149). Furthermore, the observation of the body itself could be less constrained by the need for a physical presence, in that its image could be communicated over the 'wire'. Weiner wrote how he had 'toyed' with the idea 'that it is conceptually possible for a human being to be sent over a telegraph line' (1948: 36). Today this is feasible and evident in telemedicine and on the internet. Indeed, Frank has argued that the screen has replaced the patient's body as the emblem of contemporary medicine:

> Instead we find multiple images and codings in which the body is doubled and redoubled… . For diagnostic work and even treatment purposes, the image on the screen becomes the 'true' patient, of which the bedridden body is an imperfect replicant, less worthy of attention. In the screens' simulations our initial certainty of the real (body) becomes lost in hyperreal images that are better than the real body. (1992: 83)

Bodies 'over the wire' means that patients' bodies may escape from the boundaries of the clinic or the hospital. For example, on 19 July 2002 the Surgical Skills Unit at the Medical School Hospital, University of Dundee, invited the public to witness their new virtual resources. On their website,[2] the interested parties where invited to their open day, which would offer the following:

> Virtual reality images of body organs and computer simulated surgery will be on display […]. Video relaying allows the transmission of live operations from a variety of locations […]. Training surgeons can practise similar techniques on computer simulation before and after watching the operation being performed. […] This equipment has the capability to transmit operations from hospitals all over the world by a secure link.

Anyone who has access to the internet can access the interior body and surgical interventions at any time (see, for example, www.nlm.nih.gov). Bodies have been relocated in cyberspace. Another example is the Visible Human Project[3] in which:

> The two bodies acquired through donations met bioethical standards of informed consent: a 39-year-old convict executed in Texas by lethal injection; and a 59-year-old Maryland housewife who died of cardiovascular disease. Scientists scanned the cadavers, using CT (computerized tomography) and MRI (magnetic resonance imaging). The corpses, deep-frozen in blue gelatin, were then shaved to remove thin cross-sections of tissue, from head to toe. As each layer was removed, the exposed surface was digitally photographed, creating data that computer software could reassemble, navigate and manipulate.

That most sacred object of medical training and medical knowledge (the body and the cadaver) is now not only conceptualized in terms of information

and information flows, but is also potentially seen, experienced and examined by anyone who is able to access it.[4] The medical body has not only *escaped*; it is also e-scaped in the sense that it is 'viewable' through the electronic info-scape that is the internet. We return to this below, but first let us consider how the informatization of the worldview is evidenced in medical practice.

Informational Medicine

To recap, there are those who argue that the body has been radically trans-formed in ways that accord with the informationistic worldview. This view has been perhaps most clearly articulated by the historian, biologist, and social philosopher Fox Keller:

> Today's biological organism bears little resemblance to the traditionally maternal guarantor of vital integrity, the source of nurture and substance; it is no longer even the passive material substrata of classical genetics. The body of modern biology, like the DNA molecule – and also like the modern corporate or political body – has become just another part of *an information network, now machine, now message, always ready for exchange,* each for the other. (1995: 117–8, my emphasis)

With hindsight, *surveillance medicine* could be seen as an example of the informationization worldview. Indeed, as Armstrong (1995: 395) noted, within this spatialization, illness and disease 'begins to leave the three-dimensional confine of the volume of the human body to inhabit a novel extracorporal space'. The solidity of the body began to diminish within the context of the informational flows generated by the epidemiologist. Signs and diseases were not merely located within the body but became risk factors from which a prob-ability of illness could be calculated. Epidemiology today talks less in terms of cause and effect and more in terms of probabilities and risks (Skolbekken, 1995).

In relation to the delivery and management of medicine we have already touched on telemedicine, telecare and so on. Of relevance here is the idea that the body of the patient no longer has to have a physical presence, and relatedly that the 'art of medicine' – embodied within the sight, touch, smell and ear of the clinician with the help of the laboratory scientist – has lost its authority. The 'art of medicine' associated with the experience of the individual clinician has given way to aggregated research-based information which meets certain methodological criteria. The point here is that clinical decision-making and clinical activities have come to depend not only on the results of tests within the laboratory, but also upon the systematic reviews of research undertaken by information scientists. Some illustrative examples of this informational medicine can be found in contemporary debates about evidenced-based medicine, medical education, the doctor–patient relationship, and consumer health informatics.

Evidence-based Medicine

Although evidence-based medicine – an inherently informationistic science – may be contested by some, it has become a key strand in health care practice (Sackett et al., 1996). Care packages, drug regimens and other medical interventions are subjected to systematic evaluation and the individual clinician is encouraged to take these findings into account in his or her daily practice. Furthermore, medical evidence is collated and disseminated not by clinically trained practitioners, but by experts in information science. Again, we see that medical knowledge has moved beyond the clinic and is available 'over the wire' – primarily on databases available on the internet. Clinical decision-making is rooted not in the intellect of the practitioner but within health 'intelligence' which is again an information science. Information scientists who specialize in health are a new occupational group who have their own journals and are increasingly able to influence health policy and practice. The Cochrane Collaboration, the NHS Centre for Reviews and Dissemination and the National Institute of Clinical Excellence are all institutional examples of this trend. To reiterate, we are not arguing that these trends are determined by the advent of new forms of ICT. Indeed, the observations made by Archie Cochrane while carrying out his day-to-day medical practice, that many clinical interventions were based on tradition rather than evidence, predate the routine use of computers in health research. However, the nature and growth of evidence-based medicine has been facilitated by these technologies. There is an affinity between the technological form of ICTs and the nature and form of medical practice, in that vast quantities of information are systematically retrieved, communicated and disseminated in support of the aspiration that clinical interventions should be informed by *evidence* rather than *experience*. Thus the individual practitioner does not have a monopoly over medical knowledge and expertise. How could they? There is so much of it. The modern expert, it has been argued, is no longer a person with specialist knowledge, but rather is 'someone who knows how to access knowledge efficiently and judiciously and who can form conceptual links between seemingly unrelated areas' (Fraser and Greenhalgh, 2001: 799).

Medical Education

This means that medical students need less of the 'clinical experience' so cogently described by Atkinson (1981) in his book on medical education. Now they require more training in how to access clinical information. The old style education – based around dissection, discrete disciplines, and the ward round – so long castigated by social scientists, is giving way to curricula based on integrated systems. Rather than learning facts by rote, students have to solve problems. Medical education increasingly revolves around problem-based learning (PBL) which is about gathering information, exploring and sharing ideas within a group, and, through interaction, formulating a plan. The educational argot

refers to 'non-linear learning', 'relational learning', 'informal and unstructured learning' and so on (Fraser and Greenhalgh, 2001). The General Medical Council (GMC) argues that within medical education:

> Factual information must be kept to the essential minimum […]. Learning opportunities must help students explore knowledge, and evaluate and integrate (bring together) evidence critically. The curriculum must motivate students and help them develop the skills for self-directed learning. (GMC, 2002: 5)

Medical schools have had to respond to the GMC's directives on education by developing systems-based (as opposed to discipline-based) curricula which make use of problem-based learning. The most recently established medical schools (for example, Peninsula and Hull–York Medical Schools) are fully committed to these educational methods. Thus there is an assumption that there is nothing unique or mystical about medicine, but rather that it is the development of skills whereby practitioners can access what is now widely available information.

Doctor–Patient Relationship

As we have seen, Webster (2002) has noted how medicine as information is also evident in the contemporary doctor–patient relationship. Unlike the classic sick role relationship where the doctor told the patient what was wrong and what s/he had to do or 'take' to get better, in the information age the doctor is just as likely to tell the patient what might be wrong and outline a range of possible risks, treatments or therapies. Today the ideal relationship is seen as a 'meeting between experts' (Tuckett et al., 1985), a meeting where decision-making is shared, and the goal is not patient *compliance* but *concordance* (Mullen, 1997). Within the context of *surveillance medicine*, patients present not only with illness symptoms and disease but also with an ever-increasing array of 'risk factors' associated with high blood pressure, cholesterol, smoking status, body weight, and, of course, genetic family history. Hence the problem of 'clinical risk communication' (Edwards et al., 2002) that involves developing the skills to support patients when making choices on the basis of research data and information. Information is provided by practitioners, but in the information age it is also increasingly accessed and produced by patients themselves.

Consumer Health Informatics

Consumer health informatics and electronic health information (e-health) is an issue which the medical profession is concerned about, and indeed forms a further illustration of how information flows beyond the boundaries of modern institutionalized medicine. It has been reported that around six million Americans go online for medical advice on a typical day – which is more than those who actually visit health professionals (Fox and Rainie, 2002). Any conceivable health issue may be sought at the click of a mouse. The medical pro-

fession's concern about this reflects its legacy and history of autonomy, paternalism, and altruism in that the main issue debated in the medical journals is that of the *quality* of information accessible via the internet. Patients and consumers must be protected; assessment tools and 'kite marks' abound to support 'evidence-based patient choice' (Eysenbach and Diepgen, 2001). The pros and cons of e-health are not the main concern here; the point is that health and *medical knowledge* are being metamorphosed into *information* and it is circulating beyond the walls of medical schools, hospitals, and laboratories. Medical knowledge has escaped metaphorically and literally; it can be accessed and indeed is now increasingly produced by health consumers and users (Hardey, 2001). A consequence is that throughout the media (most notably the new media) there is a radical juxtaposition of diverse types of knowledge, or rather, information. Experiential knowledge may be read alongside biomedical knowledge; commercial companies vie with independent research sites. In many ways it is not just the availability of health and medical information that is salient here, but also the means by which it is disseminated. There is a homology between the forms of knowledge and information available and the technological means that facilitate their circulation. It is a homology that requires sociological consideration, the beginnings of which – albeit at a highly abstract level – can be found in the recent work of Lash (2002) in his book *Critique of Information*.

E-Scaped Medicine?

We have already suggested that formal medical knowledge/information has escaped in the sense that it is no longer bounded by and confined within medical institutions. But we have also suggested that it takes the form of an e-scape – a notion that demands further elaboration.

The language of 'scapes' is now commonplace within sociology to communicate the idea of fluid geographies and the opportunities for the flow and exchange of 'extraordinary amounts of information' (Urry, 2000: 193). Urry writes that '*Scapes* are the networks of machines, technologies, organisations, texts and actors that constitute various interconnected nodes along which flows can be relayed' (2000: 193). The virtual geography of the e-scape on the internet is the most obvious example of this informational capacity. E-scaped medicine thus captures the idea of a new worldview and is one that resonates with discourses about the information age. The spaces, sites and locations of the production of medical knowledge are now more diffuse and are invariably mediated by means of digital technologies.

Just as Jewson (1976) suggested that there was an affinity between medical cosmologies and the socio-technological forms of knowledge production and distribution, we might speculate that there could be a homology between contemporary medical discourses and practices and privileged socio-technological forms. For example, Lash (2002) has argued that the technological means of

knowledge distribution has profound implications for knowledge and ideology. He argues that there is no longer any space for *discursive knowledge*; instead, it is displaced by what he calls *informational knowledge*. Whilst the former implies a set of beliefs, values, and theoretical underpinnings, the latter, by contrast, has no unity – it is 'outside of a systematic conceptual framework' (Lash, 2002: 3). Informational knowledge is characterized by its temporal compression, disembeddedness, real time relations, and irrationality. The irrationality is not just due to the sheer quantity of knowledge and information because, in fact, much of it will be rationally produced in various sites or locales. However, the juxtaposition of diverse types of information may, as we noted above, be epistemologically incommensurate. Within the presentation of this mass of information some epistemologies may be more dominant than others, but the amorphous nature of the medium means that the hierarchy of knowledge becomes less evident. Thus, technological form is at odds with notions of hierarchies of knowledge. As Lash puts it, 'logical and ontological knowledge no longer have a separate status from trivial everyday or empirical knowledge' (2002: 17). Not only is there diversity in terms of the ontological or paradigmatic roots of information, but there are also varied commercial interests at the base of many e-health sources. There are websites, newsgroups and chatrooms produced by formal organizations; professional bodies, charities, pressure groups, commercial companies, and individuals. Users may engage with diverse forms of knowledge that pertain to health and medical conditions, but the engagement with each source and site may be fleeting. The technological medium by which these diverse sources of information are communicated means that they may be accessed concurrently. Globally, paradigmatically, commercially and institutionally diverse sources of information are presented as equally valid on the screen for the internet user to access and read (Nettleton and Burrows, 2003).

We have summarized these developments in Table 2 by extending Jewson's (1976: 228) original diagram. Within the e-scaped medical cosmology, the '*patron*' of medical knowledge is not only the state and the academy but also increasingly the consumer and the commercial enterprise. The '*sick man*' [sic] in this context can make use of his (or more likely her) reflexive resources to become a 'health seeker' (Fox and Rainie, 2002) and an 'expert patient'. However, the ways in which users actually make use of such information clearly begs empirical scrutiny.

Medical knowledge is therefore no longer exclusive to the medical academy and the formal medical text. It has 'escaped' into the networks of contemporary info-scapes where it can be accessed, assessed and reappropriated. Rather than being concealed within the institutional domains of medicine, knowledges of the biophysical body (hitherto medicine's most sacred object) seep out into cyberspace. What is more, as we have argued, the reproduction of medical knowledge has also changed. Within the context of the medical school, medical students are taught how to make use of information in relation to specific problems rather than to understand the theoretical bases of medical sub-disciplines

Table 2 Medical cosmologies: An extension of Jewson's (1976: 228) diagram

Cosmology	Patron	Occupational role of investigator	Source of patronage	Perception of 'sick man' (sic)	Task of medical investigator	Conceptualization of illness
Bedside	Patient	Practitioner	Private fees	Person	Prognosis and therapy	Total psycho-somatic disturbance
Hospital	State-Hospital	Clinician	Professional career	Case	Diagnosis and classification	Organic lesion
Laboratory	State-Academy	Scientist	Scientific career structure	Cell complex	Analysis and explanation	Biochemical process
Surveillance	State-Academy	Epidemiologist	Professional career structure	Risk assemblage	Convert epidemiological risk to clinical risk	Latent, deviation from norm
E-scaped	State-Academy, Consumer	Information scientists	Professional career structure Commerce	Expert patient Health seekers	Assessment and communication of risks; and assessment of research evidence	Communications breakdown, interaction of systems

such as anatomy and physiology. In the language of Lash, this represents a shift from discursive knowledge to informational knowledge. Students need to defer not to their more 'experienced' colleagues but to the information scientist, who is most adept at systematically assembling knowledge and evidence on the effectiveness and appropriateness of diagnosis and treatment.

One of Jewson's key arguments was that medical knowledge was contingent upon the social relations between practitioners and patients. As medical knowledge 'escapes' and is 'e-scaped', the ability of the medical profession or laboratory scientists to shape the content of medical knowledge diminishes. The medical profession is conscious of this and has for some time tried to develop means to audit and regulate what it regards as its info-domain. Indeed in the 1960s, articles appeared in the medical journals in which doctors articulated their fears that computers and scientific engineers would invade their domain and usurp their diagnostic skills (for a discussion see Reiser, 1978: 221–6). However, any attempt to curb the dissemination of knowledges, or rather information, about health, illness, and disease is likely to be a futile exercise. And, as we have suggested, social relations between practitioners and patients, medical education, medical practices, and indeed medical knowledge itself are being transformed in ways which accord with the new scapes, opportunities, and exchanges of information.

Conclusion

In many ways this article builds on existing literatures: the rationale being to suggest, albeit tentatively, that a new medical cosmology is being forged, one we called *e-scaped medicine*. We have suggested that there is something of a homology between socio-technical changes, most notably ICTs, and ways of thinking and practising medicine. We are not, however, suggesting that the advent of such technologies has determined the emergence of a new medical cosmology, but rather that they may be facilitating existing processes of transformation. In this respect the article builds on a tradition within the sociology of health and illness which involves the identification of the conceptual parameters which underpin medical knowledge and medical practice. If the notion of *e-scaped medicine* does have any purchase, then it may well be of relevance to a number of substantive concerns within contemporary medicine. For example, some commentators have observed how the informatization of medicine may alter the degree of trust in medical practice, and that it may affect relationships between patients and professionals (O'Neill, 2002). It could also facilitate sociological appreciations of developments in health care such as the self-management of illness. Furthermore, it points to the ways in which the content of medical discourse is being restructured. Just as bedside medicine produced a medical knowledge that was acceptable to the paying patients, *e-scaped medicine* may yield more diffuse, complex, and varied forms of medical discourse that can meet the preferences of many and varied audiences. Just as the

'sick man disappeared' from laboratory medicine, it remains to be seen if the 'health seeker' and the 'expert patient' will be enduring stakeholders within *e-scaped medicine*. However, it does seem likely that its form will be more heterogeneous, its production more rooted in self-generating systems and its application more uncertain.

Acknowledgements

Notes

1 Jacobs is an urban sociologist and the author of *The Death and Life of Great American Cities* (1961). Minsky is the author of *The Society of the Mind* (1985). These ideas are also increasingly apparent within the medical literature. The *British Medical Journal*, for example, recently published a series of papers on health care (Plesk and Greenhalgh, 2001), clinical care (Wilson and Holt, 2001), management (Plesk and Wilson, 2001) and medical education (Fraser and Greenhalgh, 2001) under the general heading of 'Complexity Science'.
2 See www.dundee.ac.uk/surgicalskills (URL consulted May 2004).
3 See www.nih.gov/exhibition/dreamanatomy/da_visible_vishumhtml
4 There is, of course, a parallel in contemporary art – for example, the *BodyWorlds* exhibition (Atlantis Gallery, London, Autumn 2002) which exhibited the work of the German anatomist Gunther von Hagens.

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