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Author
Bowker, Geoffrey

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Howthings(actor -net)work:Classification,magicandtheubiquityof standards

GeoffreyC.Bowker

SusanLeighStar

GraduateSchoolofLibraryandInformationScience

UniversityofIllinoisatUrbana   -Champaign

INTRODUCTION

"Aclassifiedandhierarchicallyorderedsetofpluralities,ofvariants,hasn   oneofthestingofthe miscellaneousanduncoordinatedpluralsofouractualworld."(Dewey,1989:49)

"Wedomanythingstodaythatafewhundredyearsagowouldhavelookedlikemagic".Weallknow versionsofthisbanalassertion   -we'veprobablyall   madeitourselvesatsomepointoranother.Andifwe don'tunderstandagiventechnologyitlookslikemagic:weareperpetuallysurprisedbythemellifluous tonesreadoffourfavoriteCDsby(webelieve)alaser.Star(1995b)notesthatevenengineersb   lackbox andthinkoftechnology`asifbymagic'intheireverydaypracticaldealingswithmachines.Acommon descriptionofagoodwaiterorbutler(onethinksofJeevesintheWodehousestories)isthatsheclearsa table`asifbymagic'.Arethesetwo   kindsofmagicoroneornone?

Thefollowingpaperisanattempttoanswerthisquestion,whichcanbeposedmoreprosaicallyas:

*Whatworkdoclassificationsandstandardsdo?Wewanttolookatwhatgoesintomakingthingswork likemagic:makingt   hemfittogethersothatwecanbuyaradiobuiltbysomeonewehavenevermetin Japan,plugitintoawallinChampaignandheartheworldnewsfromtheBBC.

*Whodoesthatwork?Wewanttoexplorethefactthatallthismagicinvolvesmuchwork:ther   eisalotof hardlaborineffortlessease[1].Suchinvisibleworkisoftennotonlyunderpaid   -itisseverely underrepresentedintheoreticalliterature(StarandStrauss,inpress).Wewilldiscusswhereallthemissing work'thatmakesthingslookmag   icalgoes.

*Whathappenstothecasesthatdon'tfit?Wewanttodrawattentiontocasesthatdon'tfiteasilyintoour createdworldofstandardsandclassifications:thelefthandersintheworldofright   -handedmagic,chronic diseasesufferersinthe worldofallopathicacutemedicine,theonion   -haterinMacDonalds(Star,1991b) andsoforth.

Theseareissuesofgreatepistemological,politicalandeth   icalimport.ItiseasytogetlostinBaudrillard's (1990)coolmemoriesofsimulacra.Thehypeofourtimesisthatwedon'tneedtothinkabouttheworkany more:therealissuesarescientificandtechnological   -inartificiallife,thinkingmachines,   nanotechnology, geneticmanipulation...Clearlyeachoftheseareimportant.However,weendeavortodemonstratethat thereisrathermoreatstake   -epistemologically,politicallyandethically   -inthedaytodayworkof buildingclassificationsysteman dproducingandmaintainingstandardsthaninthesephilosophicalhigh   - fliers.Thepyrotechnicsmayholdourfascinatedgaze;theycannotprovideanypathtoansweringour questions.

Throughlookingatclassificationsystemsandstandards,wewillmovet   owardsanunderstandingofthe stuffwhichmakesupthenetworksofactornetworktheory.Latour,Callonandotherswithintheactor   - networkapproachhavedevelopedanarrayofconceptsinordertodescribethedevelopmentandoperation

of technoscience. Their valuable concepts include: regimes of delegation; the centrality of mediation; and the position that nature and society are not causes but consequences of human scientific and technical work. The position that a fact may be seen as a consequence, and not as an antecedent, is axiomatic to the American pragmatist approach as well, particularly in the work of John Dewey (e.g., Dewey, 1929). As he noted in his Experience and Nature:

For things are objects to be treated, used, acted upon and with, enjoyed and endured, even more than things to be known. They are things HAD before they are things cognized....the isolation of traits characteristic of objects known, and then defined as the sole ultimate realities, accounts for the denial to nature of the characters which make things lovable and contemptible, beautiful and ugly, adorable and awful. It accounts for the belief that nature is an indifferent, dead mechanism; it explains why characteristics that are the valuable and valued traits of objects in actual experience are thought to create a fundamentally troublesome philosophical problem. (1989[1925]:p.21)

We draw attention here to the places where the work gets done of assuring that delegation and mediation will work: to the places where human and non-human are constructed to be operationally and analytically equivalent. And following both Dewey and Latour, we also question the indifference --of nature, and of machines. So doing, we explore the political and ethical dimensions of actor-network theory, restoring the interlinked and webbed relationships between people, things, and infrastructure.

TWO DEFINITIONS

We will take a `classification' to be a spatial, temporal or spatio-temporal segmentation of the world. A `classification system' is a set of boxes, metaphorical or not, into which things can be put in order to then do some kind of work -bureaucratic or knowledge production. We will not demand of a classification system that it has properties such as:

* the operation of consistent classificatory principles (for example being solely a genetic classification (Tort, 1989) classifying things by their origin);

* mutual exclusivity of categories;

* completeness (total coverage of the world being described).

No working classification system that we have looked at meets these `simple' requirements and we doubt that any ever could (Desrosières and Thevenot, 1988).

For example, consider the International Classification of Diseases, which will be one of four major examples throughout this paper. The full title of the current (10th) edition of the ICD, is: "ICD -10 - International Statistical Classification of Diseases and Related Health Problems; Tenth Revision". Note that it is designated a `statistical' classification. By this is meant that only diseases which are statistically significant are to be entered in (it is not an attempt to classify all disease). It calls itself a `classification', even though many have said that it is a `nomenclature' since it has no single classificatory principle (i thas at least four; which are not mutually exclusive (Bowker and Star, 1994). In many cases it represents a compromise between conflicting schemes: "The terms used in categories C82 -C85 for non -Hodgkin's lymphomas are those of the Working Formulation, whi chattempted to find common ground among several major classification systems. The terms used in these schemes are not given in the Tabular List but appear in the Alphabetical Index; exact equivalence with the terms appearing in the Tabular List is not always possible".(ICD -10,1,215). However, it presents itself clearly as a classification scheme and not a nomenclature. Since 1970, there has been an effort underway by the World Health Organization to build a distinct International Nomenclature of Disease s, whose main purpose will be to provide: "a single recommended name for every disease entity" (ICD-10,1,25). The point here is that we want to take a broad enough definition so that anything that is consistently called a classification system can be inc luded. If we took a purist view, the ICD would be a nomenclature and who knows what the IND would be. With a broad definition we can look at the work that

isinvolvedinbuildingandmaintainingafamilyofentitiesthatpeoplecallclassificationsystems　　　-rather thanattempttheHerculean,Sisyphiantasksofpurifyingthe(un)stablesystemsinplace.HowardBecker makesthepointhere:"Epistemologyhasbeena...negativediscipline,mostlydevotedtosayingwhatyou shouldn'tdoifyouwantyouractivity　　tomeritthetitleofscience,andtokeepingunworthypretendersfrom successfullyappropriatingit.Thesociologyofscience,theempiricaldescendantofepistemology,givesup tryingtodecidewhatshouldandshouldn'tcountasscience,andtellswhat　　　　peoplewhoclaimtobedoing sciencedo..."(1996:54　-55).

Wewilltakea`standard'tobeanysetofagreed　　　-uponrulesfortheproductionof(textualormaterial) objects.Thereareanumberofhistoriesofstandardswhichpointtothedevelopmentandm　　　　aintenanceof standardsasbeingakeytoindustrialproduction.Thus,asDavidTurnbullpointsout,itwaspossibleto buildacathedrallikeChartreswithoutstandardrepresentations(blueprints)andstandardbuildingmaterials (regularsizesforstones,　toolsetc.)(1993).Howeveritisnotpossibletobuildamodernhousing developmentwithoutthem:toomuchneedstocometogether　　　-electricity,gas,sewer,timbersizes,screws, nailsandsoon.Thecontrolofstandardsisacentral,oftenunderanalyzed　　　　(butseetheworkofPaulDavid　- forexampleDavidandRothwell,1994　-forarichtreatment)featureofeconomiclife.Theyarekeyto knowledgeproductionaswell　-Latour(1987)speculatesthatfarmoreeconomicresourcesarespent creatingandmaintai　ningstandardsthaninproducing`pure'science.Keydimensionsofstandardsare:

*Theyareoftendeployedinthecontextofmakingthingsworktogether　　　　-computerprotocolsforInternet communicationinvolveacascadeofstandards(cf.AbbateandKahin　　,1995)whichneedtoworktogether wellinorderfortheaverageusertogainseamlessaccesstothewebofinformation.Therearestandardsfor thecomponentstolinkfromyourcomputertothephonenetwork,forcodinganddecodingbinarystreams assoun d,forsendingmessagesfromonenetworktoanother,forattachingdocumentstomessagesandso forth;

*Theyareoftenenforcedbylegalbodies　　　-betheseprofessionalorganizations;manufacturers' organizationsortheState.Wecansaytomorrowthatvolapük(auniversallanguagethatboastedsome23 journalsin1889[2])oritssuccessorEsperantoshallhe　　　nceforthbethestandardlanguageforinternational diplomacy;withoutamechanismofenforcementweshallprobablyfail.

*Thereisnonaturallawthatthebest(technicallysuperior)standardshallwin　　　　–theQWERTYkeyboard, Lotus123,DOSandVHSare　　oftencitedinthiscontext.Standardshavesignificantinertia,andcanbevery difficulttochange.

Classificationsandstandardsaretwosidesofthesamecoin.Thedistinctionbetweenthem(asweare definingthem)isthatclassificationsarecontain　　　ersforthedescriptionsofevents　-theyareanaspectof organizational,socialandpersonalmemory　-whereasstandardsareproceduresforhowtodothings　　–they areanaspectofactingintheworld.Everysuccessfulstandardimposesaclassificationsy　　　stem.

UNDERSTANDINGCLASSIFYINGANDSTANDARDIZING

Thispaperwillofferfourmajorthemesforunderstandingclassifying,standardizing(andtherelated processesofformalizing)andtheirpoliticsandhistories.Eachthemeoperatesasagestaltswitch　　　　–itcomes intheformofaninfrastructuralinversion(Bowker,1994).Invertingourcommonsensenotionof infrastructuremeanstakingwhathaveoftenbeenseenasbehindthescenes,boring,backgroundprocesses totherealworkofpoliticsandknowledgepr　　　oduction[3]andbringingtheircontributiontotheforeground. Thefirsttwo,ubiquityandmaterialtexture,speaktothespaceofactor　　　-networks;thesecondtwo,the indeterminatepastandthepracticalpolitics,speaktotheirtime.Takentogether,they　　　　sketchoutfeaturesof thehistoricallycreationoftheinfrastructurewhich(everpartially,everincompletely)orderstheworldin suchawaythatactor　-networktheorybecomesareasonabledescription.

Thefirstmajorthemeisseeingtheubiquityofcl　　　assifyingandstandardizing.Classificationschemesand standardsliterallysaturatetheworldsswelivein.Thissaturationisfurthermoreintertwined,orwebbed together.Whileitispossibletopulloutasingleclassificationschemeorstandardforrefe　　　rencepurposes,in realitynoneofthemstandalone.Soasubpropertyofubiquityisinterdependence,ifnotsmoothintegration.

The second major theme is to see classifications and standards as materially textured. Under the sway of cognitivism, it is easy to see classifications as properties of mind and standards as ideal numbers or settings. But both have material force in the world, and are built into and embedded in every feature of the built environment (and many of the borderlands, such as with engineered genetic organisms). When we think of classifications and standards as material, we can afford ourselves of what we know about material structures, such as structural integrity, enclosures and confinements, permeability, and durability, among many others. We see people doing this all the time in describing organizational settings, and a common way to hear people's experience of this materiality is through metaphors. So the generation of metaphors is closely linked with the shift to texture.

The third major theme is to see the past as indeterminate[4]. This is not a new idea to historiography, but is important in understanding the evolution of ubiquitous classification/standardization and the multiple voices that are represented in any scheme. No one classification orders reality for everyone --e.g. the red light-green light-yellow light categories don't work for blind people or those who are red-green color blind. In looking to classification schemes as ways of ordering the past, it is easy to forget those who are overlooked in this way. Thus, the indeterminacy of the past implies recovering multi-vocality; it also means understanding how standard narratives that seem universal have been constructed (Star, 1991a).

The fourth major theme is uncovering the practical politics of classifying and standardizing. There are two aspects of these politics: arriving at categories and standards, and, in the process, deciding what will be visible within the system (and of course what will thus then be invisible). The negotiated nature of standards and classifications follows from indeterminacy and multiplicity that whatever appears as universal or, indeed, standard, is the result of negotiations or conflict. How do these negotiations take place? Who determines the final outcome in preparing a formal classification? Visibility issues arise as one decides where to make the cuts in the system, for example, down to what level of detail one specifies a description of work, of an illness, of a setting. Because there are always advantages and disadvantages to being visible, this becomes crucial in the workability of the schema.

Ubiquity

In the built world we inhabit, thousands and thousands of standards are used everywhere, from setting up the plumbing in a house to assembling a car engine to transferring a file from one computer to another. Consider the canonically simple act of writing a letter longhand, putting it in an envelope and mailing it. There are standards for (inter alia): paper size, the distance that at line sare apart if it is lined paper, envelope size, the glue on the envelope, the size of stamps, their glue, the ink in the pen that you wrote with, the sharpness of its nib, the composition of the paper (which in turn can be broken down to the nature of the watermark, if any; the degree of recycled material used in its production, the definition of what counts as recycling). And so forth.

Similarly, in any bureaucracy, classifications abound --consider the simple but increasingly common classifications that are used when you dial an airline for information now ("if you are traveling domestically, press 1"; "if you want information about flight arrivals and departures, press 2...."). And once the airline has hold of you, you are classified by them as a frequent flyer (normal, gold or platinum); corporate or individual; tourist or business class; short haul or long haul (different fare rates and scheduling applies); irate or not (different hand-offs to the supervisor when you complain).

A systems approach would see the proliferation of both standards and classifications as a matter of integration --almost like a gigantic web of interoperability. Yet the sheer density of these phenomena go beyond questions of interoperability. They are layered, tangled, textured; they interact to form an ecology as well as a flat set of compatibilities. There ARE spaces between (unclassified, non-standard areas), of course, and these are equally important to the analysis. A question: it seems that increasingly these spaces are marked as unclassified and non-standard. How does that change their qualities?

It is a struggle to step back from this complexity and think about the issue of ubiquity broadly, rather than try to trace the myriad connections in any one case. We need concepts for understanding movements,

textures, shifts that will grasp larger patterns in this. For instance, the distribution of residual categories ("not elsewhere classified" or "other"), is one such concept. "Others" are everywhere. The analysis of any one instance of a residual category might yield information about biases or what is valued in any given circumstance; seeing that residual categories are ubiquitous offers a much more general sweep on the categorizing tendencies of most modern cultures. Another class of concepts which are found ubiquitously, and which speak to the general pervasiveness of standards and classification schemes, concern those which describe tangles or mismatches between subsystems. For instance, what Strauss calls a "cumulative mess trajectory" is a useful notion (Strauss, et al., 1985). In medicine, this occurs when one has an illness, is given a medicine to cure the illness, but incurs a serious side effect, which then needs to be treated with another medicine, etc. If the trajectory becomes so tangled that you can't return and the interactions multiply, "cumulative mess" results. We see this phenomenon in the interaction of categories and standards all the time --ecological examples are particularly rich places to look.

TexturingClassificationandStandardization

How do we "see" this densely saturated classified world? We are commonly used to casually black -boxing this behind -the-scenes machinery, even to the point, as we noted above, of ascribing a casual magic to it. All classification and standardization schemes are a mixture of physical entities such as paper forms, plugs, or software instructions encoded in silicon and conventional arrangements such as speed and rhythm, dimension, and how specifications are implemented. Perhaps because of this mixture, the web of intertwined schemes can be difficult to "see." In general, the trick is to question every apparently natural easiness in the world around us and look for the work involved in making it easy. Within a projector or a desktop, these seeing consists in seamlessly moving between the physical and the conventional. So when a computer programmer writes some lines of C code, she moves within conventional constraints and makes innovations based on them; at the same time, she strikes plastic keys, shifts notes around on a desktop, and consults manuals for various standards and other information. If we were to try to list out all the classifications and standards involved in writing a program, the list could run to pages. Classifications include types of objects, types of hardware, matches between requirements categories and code categories, and meta -categories such as the goodness of fit of the piece of code with the larger system under development. Standards range from the precise integration of the underlying hardware to the 60Hz power coming out of the wall through a standard size plug.

Merely reducing the description to the physical aspects such as the plugs does not get us anywhere interesting in terms of the actual mixture of physical and conventional. A good operations researcher could describe how and whether things would work together, often purposefully blurring the physical/conventional boundaries in making the analysis. But what is missing there is a sense of the landscape of work as experienced by those within it. It gives no sense of something as important as the texture of an organization: it is smooth or rough? Bare or knotty? What is needed is a sense of the topography of all of the arrangements --are they colliding? co -extensive? gappy? orthogonal? One way to begin to get at these questions is to begin to take quite literally the kinds of metaphors that people use when describing their experience of organizations, bureaucracies, and information systems (Star, in press). So, for example, when someone says something simple like "things are running smoothly," the smoothness is descriptive of an array of articulations of people, things, work and standards. When someone says, "I feel as though the whole project is moving through thick molasses," it points to the opposite experience. These are not merely poetic expressions, although at some level they are that, too. As Schon pointed out in his seminal book,
DisplacementofConcepts, a metaphor is an import, meant to illuminate aspects of a current situation via juxtaposition (1963). It is also a rich and often unmined source of knowledge about people's experience of the densely classified world.

TheIndeterminacyofthePast

There is no way of ever getting access to the past except through classification systems of one sort or another -formal or informal, hierarchical or not.... Take the unproblematic statement: "In 1640, the English Revolution occurred; this led to a twenty year period in which the English had no monarchy". The classifications involved here include:

*Thecurrentsegmentationoftimeintodays,monthsandyears.AccountsoftheEnglishrevolution generallyusetheGregoriancalendar,whichwasadoptedsomehundredyearslater   -socausingt ranslation problemswithcontemporarydocuments;

*Theclassificationof`peoples'intoEnglish,Irish,Scots,Frenchandsoon.Thesedesignationswerebyno meanssoclearatthetime   -thewholediscourseofnationalgeniusreallyonlyaroseintheni   neteenth century;

*Theclassificationofeventsintorevolutions,reforms,revolts,rebellionsandsoforth(cf.Furet,1978on thinkingtheFrenchrevolution).Thererereallywasnoconceptof`revolution'atthetime;ourcurrent conceptionismarkedby   thehistoriographicalworkofKarlMarx.

*Andthen,whatdoweclassifyasbeinga`monarchy'?Thereisastronghistoriographicaltraditionwhich saysthatOliverCromwellwasamonarch   -hewalked,talkedandactedlikeoneafterall.Underthisview   , thereisnohiatusatallinthisEnglishinstitution;ratherausurpertookthethrone.

Therearetwomajorschoolsofthoughtwithrespecttousingclassificationsystemsonthepast   -onesaying thatweshouldonlyuseclassificationsavailabletoa   ctorsatthetime(authorsinthistraditionwarnagainst thedangersofanachronism   -Hacking(1995)onchildabuseisasophisticatedversion)andtheotherthat weshouldusetherealclassificationsthatprogressintheartsandscienceshasuncovered   (typicallyhistory informedbycurrentsociologywilltakethispath   -forexampleTort's(1989)workon`genetic' classificationsystems,whichwerenotsocalledatthetime,butwhichareofvitalinteresttotheFoucaldian problematic).
Whicheverwech   oose,itisclearthatweshouldalwaysunderstandclassificationsystemsaccordingtothe workthattheyaredoing   -thenetworkwithinwhichtheyareembedded.

Whenweaskhistoricalquestionsaboutthedeeplyandheterogeneouslystructuredspaceofcla   ssification systemsandstandards,wearedealingwitha4   -dimensionalarchaeology -someofthestructuresit uncoversarestable,someinmotion;someevolving,somedecaying.Aninstitutionalmemory,aboutsay, an
epidemic,canbeheldsimultaneouslyan   dwithinternalcontradictions(sometimespiecemealordistributed andsometimeswithentirelydifferentstoriesatdifferentlocations)across[agiveninstitutional]space.

InthecaseofAIDS,forexample,thereareshiftingclassificationsoverthelast20years,includingthe inventionofthecategoryinthefirstplace.Thereisthenabackwardslookatcaseswhichmighthavebeen AIDSbeforewehadthecategory(aproble   maticgazetobesure,asBrunoLatour(forthcoming)has written
abouttuberculosis;seealsoStarandBowker,1997).Therearethestoriesaboutcollectinginformation aboutashamefuldisease,andawealthofpersonalnarrativesaboutlivingwithit.The   reisapublichealth storyandavirologystory,whichusedifferentcategorysystems.Therearethestandardizedformsof insurancecompaniesandthecategoriesandstandardsofthecensusbureau;whenanattemptwasmade tocombinetheminthe80stodi   senfranchiseyoungmenlivinginSanFranciscofromgettinghealth insurance,theresultantpoliticalchallengestoppedthecombinationofthisdatafrombeingsoused.Atthe sametime,thebloodbanksrefusedforyearstoemployHIVscreening,thusrefus   ingtheadmissionof anothercategorytotheirbloodlabeling   --asShilts(1987)tellsus,withmanycasualtiesasaresult.

PracticalPolitics

Someone,somewhere,oftenabodyofpeopleintheproverbialgraysuitsandsmoke   -filledrooms,must decideandargueovertheminutiaeofclassifyingandstandardizing.Thenegotiationsthemselvesformthe basisforafascinatingpracticalontology   --ourfavoriteexampleiswhenissomeonereallyalive?Isit breathing,attemptsatbreathing,movement....?An   dhowlongmusteachofthoselast?Whosevoicewill determinetheoutcomeissometimesanexerciseofpurepower:we,theholdersofWesternmedicineand ofcolonialism,willdecidewhatadiseaseis,andsimplyobviatesystemssuchasacupunctureorAyru   vedic medicine.Sometimesthenegotiationsaremoresubtle,involvingquestionssuchasthedisparate

viewpointsofanimmunologistandasurgeon,orapublichealthofficial(interestedinevenONEcaseof the
plague)andastatistician(forwhomonecase   isnotrelevant)(NeumannandStar,1996).

Onceasystemisinplace,thepracticalpoliticsofthesedecisionsareoftenforgotten,literallyburiedin archives(whenrecordsarekeptatall)orbuiltintosoftwareorthesizesandcompositionsofthin   gs.In additiontoourarchaeologicalexpeditionsintotherecordsofsuchnegotiations,weprovidehereesome observationsofthenegotiationsinaction.Finally,evenwhereeveryoneagreesonthewaythe classificationsorstandardsshouldbeestablished,   thereareoftenpracticaldifficultiesabouthowtocraft theirarchitecture.Forexample,aclassificationsystemwith20,000"bins"oneveryformispractically unusable.(TheoriginalInternationalClassificationofDiseaseshadsome200diseasesnotbecauseofthe natureofthehumanbodyanditsproblemsbutbecausethiswasthemaximumnumberthatwouldfitthe largecensussheetstheninuse).Sometimesthed   ecisionabouthowfine -grainedtomakethesystemhas politicalconsequencesaswell.Forinstance,indescribingandrecordingthetaskssomeonedoes,asin thecaseofnursingwork,maymeancontrollingorsurveillingtheirworkaswell,andmayimplyan   attempt to
takeawaydiscretion.Afterall,theloosestclassificationofworkisaccordedtothosewiththemostpower anddiscretion,whoareabletosettheirownterms.

Theseubiquitous,texturedclassificationsandstandardshelpframeourrepresen   tationofthepastandthe sequencingofeventsinthepresent.Theycanbestbeunderstoodasdoingtheever   -local,ever -partialwork ofmakingitappearthatsciencedescribesnature(andnaturealone)andthatpoliticsisaboutsocialpower (andsocial poweralone).ConsiderthecasediscussedatlengthbyYoung(1995)andKirkandKutchins (1992)ofpsychoanalystswhoinordertoreceivereimbursementforthisproceduresneedtocouchthemin abiomedicallanguage(theDSM)thatisanathematothem,but   isthelinguafrancaofthemedical insurance
companies.TherearelocaltranslationmechanismsthatallowtheDSMtocontinuetooperateandto providethesolelegal,recognizedrepresentationofmentaldisorder.A`reverseengineering'oftheDSMor theICDrevealsthemultitudeoflocalpoliticalandsocialstrugglesandcompromiseswhichgointothe constitutionofa`universal'classification.

INFRASTRUCTUREANDACTORNETWORKTHEORY

Wehave,then,lookedbrieflyatthespaceandtimeoftheinfra   structuresthatsubtendactor -networks.Our positionisthatthroughdueattentiontotheseinfrastructures,wecanachieveanunderstandingofhowitis thatactornetworktheorycomestobeausefulwayofdescribingthenaturescientificknowledgeonth   eone handandthe(increasing)convergenceofhumanandnon   -humanontheother.

Theconvergingsamenessofhumansandnon   -humans,andingeneraltheconstructionofaworldinwhich actor-networktheoryistrue,isapoliticalandethicalquestion.Work   byscholarssuchasJoanFujimura (1991),ValerieSingletonandMikeMichael(1993)andLeighStar(1991b;1995)haspointedtothefact that
actor-networktheorycanbereadasanuncriticalcelebrationofthepowerofmodernscienceand technology.TherearecertainlyreadingsofLatour'sScienceinActionorThePasteurizationofFrance which
couldsupportsuchanassertion.Throughourconcentrationontheworkofstandardizationand classification -aconcentrationfullyconsonantwith   theanalysisofLatourandCallon   -wearepointingtoa placewhereactor -networktheorycanbefurtherdeveloped;andtoaplacewhereitspoliticalsidemeetsits philosophicalunderpinnings.

Inordertoclarifyyourpositionhere,letustakeananal   ogy.IntheearlynineteenthcenturyinEnglandthere wereahugenumberofcapitalcrimes   -startingfromstealingaloafofbreadandgoingup....However, preciselybecausethepenaltiesweresodraconian,fewjurieswouldeverimposethemaximumsente   nce; andindeedtherewasactuallyadrasticreductioninthenumberofexecutionsevenasthepenalcodewas progressivelystrengthened.Therearetwowaysofwritingthishistory   -onecaneitherconcentrateonthe creationofthelaw;oronecanconcent   rateonthewaythingsworkedoutinpractice.Thisisverysimilarto

thepositiontakeninLatour'sWehaveneverbeenmodern:wherehesayswecaneitherlookatwhat scientistssaythattheyaredoing(workingwithinapurifiedrealmofknowledge)ora   twhattheyactually are
doing(manufacturinghybrids).Actornetworktheoryhaslookedindetailattheroleofrelativelyblack   - boxed
hybridsincreatingthediscourseofpurescienceasendpoint;weareadvocatingadevelopmentofthe theorythatpaysm   oreattentiontotheclassificationandstandardizationworkthatallowsforhybridstobe manufacturedandsoexplorestheterrainofthepoliticsofscienceinaction.

Thepointforusisthatbothofthesearevalidkindsofaccount.Earlyactor   -networktheoryconcentratedon thewaysinwhichitcomestoseemthatsciencegivesanobjectiveaccountofnaturalorder:trialsof strength,enrollingofallies,cascadesofinscriptionsandtheoperationofimmutablemobiles.Itdrew attentiontotheimport   anceofthedevelopmentofstandards(thoughnottothelinkeddevelopmentof classificationsystems);butdidnotlookattheseindetail.Wewereinvitedtolookattheprocessof producingsomethingwhichlookedlikewhatthepositivistsallegedscience   tobe.Wegottoseethe`Janus face'ofscience.Insodoingwe`followedtheactors'.Wesharedtheirinsights(alliesmustbeenrolled, translationmechanismsmustbesetintrainsothat,inthecanonicalcase,Pasteur'slaboratoryworkcanbe seenasadirecttranslationofthequestforFrenchhonorafterdefeatinthebattlefield).

However,bytheverynatureofthemethod,wealsosharedtheirblindness.Theactorsbeingfolloweddid not
seewhatwasexcluded:theyconstructedaworldinw   hichthatexclusioncouldoccur.Thusifwejust follow
thedoctorswhocreatetheInternationalClassificationofDiseasesattheWorldHealthOrganizationin Geneva,wewillnotseethevarietyofrepresentationsystemsthatothercultureshaveforclass   ifying diseasesofthebodyandspirit;andwewillnotseethefragilenetworkstheseclassificationsystems subtend.Rather,wewillseeonlythoseactantswhoarestrongenough,andshapedintherightway,to impactthefragileactor   -networksofallopa   thicmedicine.Wewillseetheblindleadingtheblind.

WeascribetoLatour's(1987)definitionofrealityas`thatwhichresists'(again,aconceptwithstrong Americanpragmatistresonances,see.g.Dewey,1916).Theactor   -networkwillbechangedbyt   he resistancesthatitencounters.Wehavesuggestedthattheworkofdealingwithresistanceistwofold:

*Changingtheworldsuchthattheactor   -network'sdescriptionofrealitybecomestrue.Thusifalldiseases (ofthemindandbody)areclassifiedp   urelyphysiologicallyandsystemsofmedicalobservationand treatmentaresetupsuchthephysicalmanifestationsaretheonlymanifestationsrecordedandphysical treatmentsaretheonlytreatmentsavailablethenitisofcoursepossiblethattheworldw   illbesuchthat schizophrenia,say,resultspurelyandsimplyfromachemicalimbalanceinthebrain.Itwillbeimpossible to
thinkoractotherwise.Wehavecalledthistheprincipleofconvergence(StarandBowker,1994;Neumann, BowkerandStar,inpr   ess).

*Distributingtheresistanceinsuchawaythatitbecomesmarginalizedandcanbeoverlooked.

Agoodexampleofresponsestoresistancescomesfromthenursingadministratorswearestudyingat present.Wewillseehowtheyareproducingaclas   sificationofnursingworkwhosepoliticaledgeisinthe technicalworkofmeshingthisclassificationsystemwiththosealreadyoperatingwithinthesociotechnical frameworkofthehospital.Thereisaplayofresistancesaroundthispoliticalofreprese   ntation.

TheIowaInterventionTeamareproducingaclassificationofallnursingwork   -anursinginterventions classification(NIC)(McCloskeyandBulechek,1996).NICitselfisafascinatingsystem.Thoseofus studyingitseeitasanethnomethodologicalnirvana.Somecategories,likebleedingreduction   -nasal,are onthesurfacerelativelyobviousandcodableintodiscreteunitsofworkpracticetobecarriedouton specific
occasions.Butwhatabouttheequal   lyimportantcategoriesofhopeinstallationandhumor?Hope

installationincludesthesubcategoryof`Avoidmaskingthetruth'.Thisisnotsomuchsomethingthat nurses

doonaregularbasis,assomethingthattheyshouldnotdoconstantly.Italsoinclu des:`Helpthepatient expandspiritualself'.Herethecontributionthatthenurseismakingistoanimplicitlifelongprogramof spiritualdevelopment.Withrespecttohumor,theverydefinitionofthecategorysuggeststheoperationof a

paradigmshift :"Facilitatingthepatienttoperceive,appreciate,andexpresswhatisfunny,amusing,or ludicrousinordertoestablishrelationships";anditisunclearhowthiscouldeverbeattachedtoatime line:

itissomethingthenurseshouldalwaysdowhiled oingotherthings.Further,containedwithinthenursing classificationisananatomyofwhatitistobehumorous,andatheoryofwhathumordoes.The recommendedproceduresbreakhumordownintosubelements.Oneshoulddeterminethetypesofhumor appreciatedbythepatient;determinethepatient'stypicalresponsetohumor(e.g.laughterorsmiles);select humorousmaterialsthatcreatemoderatearousalfortheindividual(forexample`pictureaforbidding authorityfiguredressedonlyinunderwear');e ncouragesillinessandplayfulnessandsoontomakeatotal offifteensub -activities:anyoneofwhichmightbescientificallyrelevant.Afeaturetraditionallyattached tothe

personalityofthenurse(beingacheerfulandsupportiveperson)isnowatta chedthroughtheclassification tothejobdescriptionasaninterventionwhichcanbeaccountedfor.

Withinthecontextofthehospital'ssociotechnicalsystem,nursingworkhasbeendeemedirrelevanttoany possiblefuturereconstruction;ithasbeenc anonicallyinvisible,inStar's(1991a)term.ThelogicofNIC's advocatorsisthatwhathasbeenexcludedfromtherepresentationalspaceofmedicalpracticeshouldbe included.TheIowagroup,thekernelofwhomwereteachersofnursingadministration,m adeessentially threeargumentsforthecreationofanursingclassification.First,itwasarguedthatwithoutastandard languagetodescribenursinginterventions,therewouldbenowayofproducingascientificbodyof knowledgeaboutnursing.NICint heorywouldbearticulatedwithtwootherclassificationsystems:NOC (the

nursingsensitivepatientoutcomesclassificationscheme)andNANDA(thenursingdiagnosisscheme). Thethreecouldworktogetherthusly.Onecouldperformstudiesoverasetofhospitalsemployingthethree schemesinordertocheckifagivencategoryofpatientrespondedwelltoagivencategoryofnursing intervention.Ratherthanthiscomparativewo rkbeingdoneanecdotallyasinthepastthroughthe accumulationofexperience,itcouldbedonescientificallythroughtheconductofexperiments.TheIowa Interventionprojectmadeupajingle:NANDA,NICandNOCtothetuneofHickory,Dickory,Dockto stress

thisinterrelationshipofthethreeschemes.Thesecondargumentforclassifyingnursinginterventionswas thatitwasakeystrategyfordefendingtheprofessionalautonomyofnursing.TheIowanursesarevery awareoftheliteratureonprofession alization -notablySchon(1983) -andareawareoftheforceofhaving an

acceptedbodyofscientificknowledgeastheirdomain.(IndeedAndrewAbbott,takingashiscentralcase the

professionalizationofmedicine,makesthisoneofhiskeyattributesof aprofession[1988].)Thethird argumentwasthatnursing,alongsideothermedicalprofessions,wasmovingintothenewworldof computers.Astherepresentationalmediumchanged,itwasimportanttobeabletotalkaboutnursingina languagethatcomput erscouldunderstand -elsenursingworkwouldnotberepresentedatallinthefuture, andwouldriskbeingevenfurthermarginalizedthanitwasatpresent.

However,thereisalsoadangerinrepresenting.Itismoredifficulttohiveoffaspectsofnur singdutiesand givethemtolowerpaidadjuncts,ifnursingworkisrelativelyopaque.Thetestsitesthatareimplementing NIChaveprovidedsomedegreeofresistancehere,arguingthatactivitiesshouldbespecified -sothat, withinasoftdecisionsup portmodelagivendiagnosiscantriggeranursinginterventionconstitutedofa single,well -definedsetofactivities.AsMarcBerg(inpress)hasnotedinhisstudyofmedicalexpert systems,suchdecisionsupportcanonlyworkuniversallyiflocalprac ticesarerenderedfullystandard.A key

professionalstrategyfornursing -particularlyinthefaceoftheubiquitousprocessre -engineer -isrealized bydeliberatenon -representationintheinformationinfrastructure.Whatisrememberedintheformal

informationsystemsresultingisattunedtoprofessionalstrategyandtotheinformationrequisitesofthe nurses'takeonwhatnursingscienceis.

Further,thereisabrickwallthattheycomeupagainstwhendealingwithnursesonthespot:ifthey overspecifyanintervention(thatisbreakitdownintotoomanyconstituentparts),thenitgetscalled,inthe field,anNSSclassification   -whereNSSstandsfor`Noshit,Sherlock'andisnotused(Bowker,Starand Timmermans,1996).Itisassumedthatanyreasonableeducationinnursingormedicineshouldleadtoa commonlanguagewhereinthingsdonotneedspellingouttotheultimatedegree.Theinformationspace willbesufficientlywellpre -structuredthatsome detailscanbeassumed.Attentiontothefiner   -grained detailsisdelegatedtotheeducationalsystem,whereitisoverdetermined.

TheseNIC -relatedstrategiesofdealingwithoverspecificationandthepoliticaldrivetorelativeautonomy by
droppingthi ngsoutoftherepresentationalspace   -areessentialforthedevelopmentofasuccessful actor-networksystemthatincludesnursing.Thesetwoformsoferasureoflocalcontextareneededinorder tocreatetheveryinfrastructureinwhichnursingcanbot   happearasasciencelikeanyotherandyet nursing
asaprofessioncancontinuetodevelopasarich,localpractice.Theongoingerasureisguaranteedbythe classificationsystem:onlyinformationaboutnursingpracticerecognizedbyNICcanbecodedo   nthe forms
fedintoahospital'scomputersorstoredinafilecabinet.

Nursinginformaticiansagreeasabodythatinorderforproperhealthcaretobegivenandfornursestobe recognizedasaprofession,hospitalsasorganizationsshouldcodeforn   ursingwithintheframeworkoftheir memorysystems:nursingworkshouldbeclassifiedandformsshouldbegeneratedwhichutilizethese classifications.However,therehasbeendisagreementwithrespecttostrategy.Tounderstandthe differencethathase merged,recalloneofthoseformsyouhavefilledin(wehaveallexperiencedone) which
donotallowyoutosaywhatyouthink.Youmay,inastandardcase,havebeenofferedachoiceofseveral racialorigins;butmaynotbelieveinanysuchcategorizati   on.Thereisnoroomontheformtowritean essay
onraceidentitypolitics.Soyoueitheryoumakeanuncomfortablechoiceinordertogetcounted,andhope thatenoughofyourcomplexitywillbepreservedbyyoursetofanswerstotheform;oryoudon't   answer the
questionandperhapsdecidetodevotesometimetolobbyingtheproducersoftheoffendingformto reconsidertheircategorizationofpeople.TheNICgrouphaswrestledwiththesamestrategicchoice: fitting
theirclassificationsystemintoth eProcrusteanbedofalltheotherclassificationsystemsthattheyhaveto articulatewithinanygivenmedicalsettinginordertoformpartagivenorganization'spotentialmemory; or
rejectingthewaysinwhichmemoryisstructuredintheorganizations   thattheyaredealingwith.Wewill now
lookinturnateachofthesestrategies.

Letuslookfirstattheargumentforincluding NICwithintheinformationinfrastructuralframeworkofthe hospital'ssociotechnicalsystem.TheyarguethatNIChastorespondtomultipleimportantagendas simultaneously.Considerthefollowingdescriptionofneedsforastandardvocabularyofnursingpractice:

Itisessentialtodevelopastandardizednomenc   latureofnursingdiagnosesinordertonamewithout ambiguitythoseconditionsinclientsthatnursesidentifyandtreatwithoutprescriptionfromother disciplines;suchidentificationisnotpossiblewithoutagreementastothemeaningofterms.Profess   ional standardsreviewboardsrequirediscipline -specificaccountability;someurgencyindevelopinga discipline-specificnomenclatureisprovidedbytheimpendingNationalHealthInsurancelegislation,since demandsforaccountabilityarelikelybothto   increaseandbecomemorestringentfollowingpassageofthe legislation.Adoptionofastandardizednomenclatureofnursingdiagnosesmayalsoalleviateproblemsin communicationbetweennursesandmembersofotherdisciplines,andimprovementininterdisc   iplinary

communicationcanonlyleadtoimprovementinpatientcare.Standardizationofthenomenclatureof nursing
diagnoseswillpromotehealthcaredeliverybyidentifying,forlegalandreimbursementpurposes,the evaluationofthequalityofcareprov idedbynurses;facilitatethedevelopmentofataxonomyofnursing diagnoses;providetheelementforstorageandretrievalofnursingdata;andfacilitatetheteachingof nursingbyprovidingcontentareasthatarediscrete,inclusive,logical,andconsi stent.(Castles,1981,38)

WehavecitedthispassageatlengthsinceitunitesmostofthemotivationsforthedevelopmentofNIC. The
developmentofanewinformationinfrastructurefornursing,heraldedinthispassage,willmakenursing more`memora ble'.Itwillalsoleadtoaclearanceofpastnursingknowledge -henceforthprescientific - from
thetextbooks;itwillleadtochangesinthepracticeofnursing(aredefinitionofdisciplinaryboundaries) -a shapingofnursingsothatfuturepractice convergesonitsrepresentation.

Manynursesandnursinginformaticiansareconcernedthattheprofessionitselfmayhavetochangetoo muchinordertomeettherequirementsoftheinformationinfrastructure.Wemurder,theynote,todissect. In
herstu dyofnursinginformationsystemsinFrance,InaWagner(1993)speaksasfollowsofthegambleof computerizingnursingrecords:

Nursesmightgaingreaterrecognitionfortheirworkandmorecontroloverthedefinitionofpatients' problemswhilefindingoutthattheirpracticeisincreasinglyshapedbythenecessitytocomplywith regulators'andemployers'definitionsof'billablecategories.'

Indeed,aspecificfeatureofthis'thoughtworld'intowhichnursesaregraduallysocia lizedthroughtheuse of
computersystemsistheintegrationofmanagementcriteriaintothepracticeofnursing.Shecontinues: "Workingwithapatientclassificationsystemwithtimeunitsassociatedwitheachcareactivityenforcesa specifictimedisci plineonnurses.Theylearntoassesspatients'needsintermsofworkingtime."This analyticperspectiveissharedbytheIowanurses.Theyarguethatdocumentationiscentrallyimportant;it notonlyprovidesarecordofnursingactivitybutstructures same:

Whilenursesdocomplainaboutpaperwork,theystructuretheircaresothattherequiredformsgetfilled out.
Iftheformsreflectaphilosophyofthenurseasadependentassistanttothedoctorwhodeliverstechnical careinafunctionalmanner, thisistosomeextentthewaythenursewillact.Iftheformsreflecta philosophy
ofthenurseasaprofessionalmemberofthehealthteamwithauniqueindependentfunction,thenursewill actaccordingly.Inthefuture,withtheimplementationofpri ce-per-casereimbursementvis -à-visdiagnosis relatedgroups,documentationwillbecomemoreimportantthanever.(BulechekandMcCloskey,1985, 406).

AstheNICclassificationhasdeveloped,observesJoanneMcCloskey,thetraditionalcategoryof`nursin  g process'hasbeenreplacedby`clinicaldecisionmakingplusknowledgeclassification'.Andina representationofNICthatsheproducedboththepatientandthenursehaddroppedentirelyoutofthe picture(bothwere,shesaid,locatedwithinthe`clin icaldecisionmakingbox'onherdiagram)(Iowa InterventionProjectmeeting,6/8/95).Arecentbookaboutthenextgenerationnursinginformationsystem arguedthatthenewsystem:

Cannotbeassembledlikeapatchworkquilt,bypiecingtogethercomponen tsofexistingtechnologiesand softwareprograms.Instead,thesystemmustberebuiltonadesigndifferentfromthatofmostapproaches usedtoday:itmustbeadata -drivenratherthanaprocess -drivensystem.Adominantfeatureofthenew systemisitsfocusontheacquisition,management,processing,andpresentationof'atomic -level'datathat canbeusedacrossmultiplesettingsformultiplepurposes.Theparadigmshifttoadata -drivensystem representsanewgenerationofinformationt echnology;itprovidesstrategicresourcesforclinicalnursing

practice,ratherthanjustsupportforvariousnursingtasks.(Zielstorffetal.,1993,1).

Thisspeakstotheprogressivedenialofprocessandcontinuitythroughthesegmentationofnursin g practiceintoactivityunits.Manyarguethatinorderto`speakwith'databasesatanationalandinternational leveljustsuchsegmentationisneeded.Thefearisthatunlessnursescandescribetheirprocessthisway (attheriskoflosingtheessence ofthatprocessinthedescription),thenitwillnotbedescribedatall.They canonlyhavethereownactionsrememberedatthepriceofhavingothersforget,andpossiblyforgetting themselves,preciselywhatitisthattheydo.

Somenursinginformat icianshavechoseninsteadtochallengetheinformationalframeworkexistinginthe medicalorganizationstheydealwith.TheyhaveadoptedaBatesonianstrategyofrespondingtothethreat of thenewinformationinfrastructurebymovingthewholeargument uponelevelofgeneralityandtryingto supplant`data -driven'categorieswithcategoriesthatrecognizeprocessontheirownterms.ThustheIowa teampointedtothefactthatwomenphysiciansoftenspendlongerwithpatientsthanmaledoctors,butthey needtoseepatientslessoftenasaresult:theyarguethatjustsuchaprocess -sensitivedefinitionof productivityneedstoarguedforandimplementedinmedicalinformationsystemsinorderthatnursing work getsfairlyrepresented(IowaIntervention Projectmeeting,6/8/95).Theydrawfromtheirsecret(because unrepresented)reservoirofknowledgeaboutprocessinordertochallengethedata -drivenmodelsfrom within.

Withinthisstrategy,thechoiceofalliesisbynomeansobvious.Sincewiththe developmentofNICweare dealingwiththecreationofaninformationinfrastructure,thewholequestionofhowandwhattochallenge becomesverydifficult.Scientistscanonly,willynilly,dealwithdataaspresentedtothembytheir information base, justashistoriansofpreviouscenturiesmust,alas,relyonwrittentraces.Whencreatinganew informationinfrastructureforanoldactivity,questionshaveahabitofrunningawayfromone:atechnical issueabouthowtocodeprocesscanbecomeachall engetoorganizationaltheory(anditsdatabase).A defenseofprocesscanbecomeanattackonthescientificworldview.OneofthechiefattacksontheNIC schemehasbeenmadebyanursinginformatician,SusanGrobe,whobelievesthatratherthanstandardize nursinglanguagecomputerscientistsshoulddevelopnaturallanguageprocessingtoolssothatnurse narrativescanbeinterpreted.Grobearguesforthe abandonmentofanygoalofproducing:"Asingle coherentaccountofthepatternofactionandbeliefsinscience"(1992,92);shegoesontosaythat: "philosophersofsciencehavelongacknowledgedthevalueofamultiplicityofscientificviews"(92).Sh e excoriatesBulechekandMcCloskey,architectsofNIC,forhavingproducedwork:"derivedfromthe natural scienceviewwithitshierarchicalstructuresandmutuallyexclusiveanddistinctcategories."(93).Sheon the otherhandisdrawingfromcognitive science,libraryscienceandsocialscience(94).Oragain,arecent paperonconceptualconsiderations,decisioncriteriaandguidelinesfortheNursingMinimumDataSet citedFritjofCapraagainstreductionism,StevenJayGouldonthesocialembeddednes sofscientifictruth andpraisedFoucaultforhavingdevelopedaphilosophicalsystemto"grapplewiththisreality"(Kritek, 1988, 24).Nursescientists,itisargued,"havebecomequitereductionisticandmechanisticintheirapproachto knowledgegener ation,atatimewhennumerousothers,particularlyphysicists,arereversingthatpattern" (p.27).Andnursinghastofindalliesamongstthesephysicists:

Nurseswhodelivercareengageinaprocess.Itisactuallythecyclic,continuousrepetitionof acomplex process.Itisdifficult,therefore,tosketchtheboundariesofadiscretenursingevent,aunitofservice,and, therefore,aunitofanalysis.Timeisclearlyacentralforceinnursingcareandnursingoutcomes.Nurses haveonlybeguntostr ugglewiththisfactor.Ithasacentralitythateludesexplicationwhenplacedinthe contextofquantumphysics.(Kritek,1988:28)

Thepointthereisnotwhetherthisargumentisrightorwrong.Itisaninterestingposition.Itcanonlybe maintained,ascanmanyoftheotherpossiblelinksthatbristlethroughtheNICliterature,becausethe

informationinfrastructureitselfisinflux.Whentheinfrastructureisnotinplacetoprovidea`natural'
hierarchyoflevels,thendiscoursescananddomake   strangeconnectionsbetweenthemselves.

Iftheywanttoproveacasewithinagivenhospitalfortheopening   -upofanewnursingposition,theyneed
to
demonstratethatnursingiscost   -effectiveaccordingtothedominantaccountancyparadigm.Nowtheyin
fact
disagreewiththisparadigm(arguing,forexample,that`qualityofcare'isnotquantifiablebutisstill
significant);andyettheyfeelthattheymustactasiftheyacceptit   -orsetheirvoicewillnotbeheardat
all.
ThereareagroupofradicalaccountantswhoargueforthekindsofpositionthattheNICnursesaretaking;
however,theseaccountantsaretiedintoadifferentseriesoflocalbattlesaboutclassificationand
standardization.Theresistancetosuchcost   accountingmightbelargeintheaggregatewhileitsimpact,
becauseofeffectivedistribution,isminimal.

Inordertonotbecontinuallyerasedfromtherecord,nursinginformaticiansareriskingeithermodifying
their
ownpractice(makingitmoredata   driven)orwagingaQuixoticwarondatabasedesigners.The
correspondinggainisgreat,however.Iftheinfrastructureitselfisdesignedinsuchawaythatnursing
informationhastobepresentasanindependent,welldefinedcategory,thennursingitse   lfasaprofession
willhaveamuchbetterchanceofsurvivingthroughroundsofprocessre   -engineeringandnursingscience
asadisciplinewillhaveafirmfoundation.TheinfrastructureassumesthepositionofBishopBerkeley's
God:aslongasitpaysat   tentiontonurses,theywillcontinuetoexist.Havingensuredthatallnursingacts
arepotentiallyrememberedbyanymedicalorganization,theNICteamwillhavegonealongwayto
ensuring
thefutureofnursing.

Whatactor -networktheoryhastooffer   initsapproachtoresistanceisareadingofwhereandhowpolitical
workisdoneintheworldoftechnoscience;andhowsuchworkcanbeproblematizedandchallenged.
DonaldMacKenzie'swonderfulstudyof`missileaccuracy'furnishesthebestexampleof   thisapproach.In
a
concludingchaptertohisbook,hediscussesthepossibilityof`uninventingthebomb',bywhichhemeans
changingsocietyandtechnologyinsuchawaythattheatomicbombbecomesanimpossibility.Such
change,hesuggests,canbecarr   iedoutinpartattheovertlevelofpoliticalorganizations.However,and
cruciallyforourpurposes,healsosensitizesthereadertothesiteofthedevelopmentandmaintenanceof
technicalstandardsasasiteofpoliticaldecisionsandstruggle.Stand   ardsandclassifications,howeverdry
andformalonthesurfacearesuffusedwithtracesofpoliticalandsocialwork.

CONCLUSION

Itisdifficultwhendiscussinganytheorytoadopttheappropriatedegreeofreflexivity.Actor   -network
theory
tellsusquiteclearlythatatheoryshouldnotbejudgedaccordingtoanabsolutesetofindicators,but
accordingtotheworkthatitdoesintheworld.Howdoesthetheoryitselfstandupagainstthiscriterion?

Wehavearguedthatitcandoagoodjo   bindrawingourattentiontotherealpoliticalworkthatisbeing
done
inthedevelopmentoftechnoscience;andcanprovideuswithsomeusefulconceptsforanalyzingthat
work.
Wehavenotinthispaperargued,butwouldmaintain(inaccordanceespecial   lywithMichelSerres'corpus;
andtoanextentLatour'sWehaveneverbeenmodernandDieuxFaitiches)thesymmetricalpositionthat
thereisrealphilosophicalandscientificworkbeingdoneintherealmtraditionallyseenasthepurely
political.Thece   ntralpointisthattechnoscientificsocietiesarepowerfulpreciselybecausetheyaresogood
atdelegatinganddistributing;andthatactor   -networktheoryiswellpositiontotrackanddescribethework
of
delegationanddistribution.

Does this mean th at actor -network theory is the theory for our times? Indeed not. However, it is a theory which takes the work of classification and standardization seriously; and so provides one way of understanding the development of a master narrative (Western science)   which is not a master narrative (because it frequently breaks down locally as postmodernists would remind us) and yet which act likes one (in that it enacts the very exclusions and silencing that allow it to appear to be true). The magic of modern technoscience is a lot of hard work.

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