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Distance

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Abstract: The English language has long acknowledged and required some preconception of distance, but it has only been considered explicitly as a key element of human geography for half a century. The distances of greatest consequence in human geography are those between public places on the earth's surface. Measures of physical distance have become increasingly standardized, but anomalous practices persist. Straight-line distance in nature has less applicability to human geography than route distance on a transport network. Even circuitous distance measures may be less useful measures of the separation of places than the time, expense and effort of traversing distances. Cognitive and compound distance also measure relative distance. In human geography distance is treated mainly as an organizing principle in location decision making and travel behavior, as a deterrent to spatial interaction and diffusion, and as a differentiator. Advances in rapid, long-range transport and communication have mediated sheer physical distance and rendered it less significant. Yet even while the world shrinks metaphorically, distances measured in relative terms are being reconfigured unevenly and imaginatively. Even where distance has ceased to be a material concern, the idea and discourse of distance survives.

Keywords: distance; scale; space.

Introduction

Distance is one of the key elements of the world. Distances on our planet are in some senses definitive: they are the way we get to know it, speak about it, associate with it and navigate our way around it. The Earth's size is measured not by mass but by circumference, conventionally at the Equator. Referring to distances across continents and oceans, and between cities, is a popular way of registering where we live and work, how close or how far we are from other places, and how big an undertaking some journey may be. Place and distance are mutually constitutive. The distance we are from events elsewhere is often a measure of how seriously we take them; places that are out of sight are often out of mind. The distance that people traverse is an indicator of their mobility; the distance that places are from us is a clue to their accessibility. The (f)actuality of distance is undeniable, yet as this chapter argues, distance is also an idea. Personal experiences of distance are varied. The diverse ways in which distance has been used, worked with, and thought about in human geography also indicate that it is not a simple, one-dimensional phenomenon. Like other terms that we take for granted and seldom interrogate, distance refers to an elusive phenomenon. It is more or less visible and it has a concrete identity, but it is also an abstract notion whose nature, dimensions and meaning are difficult to pin down. Arguably, the concept of distance is one of the key building blocks of human geography. Yet, whereas many people would readily associate geography with continents, countries and hemispheres, with ocean currents, national capitals and mountain ranges, few would quickly identify distance as geography's stock-in-trade. The observation suggests that distance does indeed have an abstract quality. Professional geographers are more likely than members of the public to nominate distance as a core concept: geographers would regard distance as complementing

other fundamentals such as scale, place, region and boundary. Starting half-a-century ago, several geographers have argued that distance is one of geography's basic elements. In his inaugural address as Professor of Geography at the University of Edinburgh in 1954, J Wreford Watson went so far as to assert that geography was a discipline in distance. His presentation actually made a better case for the notions of extent, reach, spread and distribution being at the heart of the discipline. Distance, Watson suggested, was a useful surrogate indicator of the extent to which objects have adapted to or dominated the environment. In geography, he noted, the emphasis on distance was an emphasis on extent. In Watson's view, geography mapped humanity's success or failure to extend ideas, ways, numbers and control. In the final analysis, he wrote, geographical distances were the distances of the human spirit.

In the age-old conception of geography as a discipline that deals with regional diversity and dissimilarity (even uniqueness), distance presented itself as something that could account for difference. The argument that distance was a central plank in human geography received a boost in the 1960s when a new scientific geography was being formulated and championed. At a time when young geographers were eagerly injecting scientific rigor into their work, the standardized and mathematically measurable properties of distance were very attractive. In the hunt for law-like patterns and principles of spatial organization, quantifiable distance was an entity that research scientists could use to explain similarity and difference. In the 1960s several American geographers working in the new spatial paradigm stressed the importance of distance to their subject. Among others, it was said that the first law in geography was that nearby places and phenomena were more similar than those far apart. A book on theoretical geography claimed that nearness was the cardinal problem in geography.

Elsewhere, distance and separation were said to be fundamental geographical properties. Emphasis on the centrality of distance to human geography faded after the 1960s. However, as if confirming that geographically-informed conversation, analysis and speculation is impossible without some notion of distance, the d-word continues to thread through all geographical discourse. This does not amount to a field of study. The term distance seldom appears in any keyword or subject search among geographical research papers. Even dictionaries of human geography take the view that the definition of distance is self-evident. The subject areas in which distance remains a defining topic are at a scale quite different to that at which geography operates. Astronomy and space science are at the one extreme. These disciplines deal with the greatest conceivable physical distances. Estimating, measuring and assessing the significance of the vast spaces between planets, stars and even galaxies remain a major scientific challenge. At the other extreme are the miniscule intervals that fascinate and bewilder engineers and machinists. At a rather larger scale are the culturally variable interpersonal distances tolerated during personal interaction such as greeting, sitting, standing and talking. These psycho-social distances are the subject of proxemics rather than human geography.

This chapter is about distances that are part of everyday human public experience – these distances define and occur in the public rather than the private spaces that human beings occupy, confront and move across. In human geography the distances of interest are those between places on Earth, and those that involve more than a few steps of travel in outdoor spaces. Put another way, geographers' distance currencies are miles and kilometers rather than stellar parsecs, hair's breadth microns, or distances to do with eye contact, speech audibility or human intimacy. Geographical distance is also generally horizontal as opposed

to the centimeters and meters (or inches and feet) that measure the height, width, depth, length and breadth of objects.

Discourses of distance

The many literal and figurative references to distance in spoken and written language confirm the hold that it has had on everyday life. Among the explicit references to distance in English are phrases to do with stamina and additional effort. The coinage ‘go the distance’ refers to completing a metaphorical journey: boxers who fail to go the distance have been knocked out, counted out, or threw in the towel. To ‘go the extra distance’ means doing more than is necessary or expected. Here the reference is often to a particular unit measure of distance, as in ‘go the extra mile’. A place said to be miles away means it simply feels far. To say that a miss is as good as a mile indicates that the magnitude of shortfalls or gaps is irrelevant. Judging something miles better than another is a colloquialism that has nothing to do with actual distance. Similarly, running a mile means taking steps to avoid a personal pest. To speak of a proposal not having much mileage in it refers to the absence or presence of advantage; conversely, getting a lot of mileage out of something means putting something to good use. The persistence of these mile-based phrases reflects the tenacious link between the English language and imperial distance measures.

The admonition ‘keep your distance’ is a recommendation or warning not to get unduly or inappropriately close to some person or event. Close parallels are ‘stay away’, ‘know your place’ and ‘respectful distance’, phrases loaded with geographical innuendo. No precise distance is specified; it is assumed that the ‘right’ distance is known intuitively or (can be learned) experimentally. Animal growls and hisses are warnings about getting too close; humans have their own repertoire of gestures about crossing an imperceptible line and invading personal space.

Indirect references to distance in everyday conversation are possibly more plentiful than direct references. At least in English, notions of distance are wound into a rich spatial vocabulary. At its very simplest, distance is implied in some unspecified distinction between ‘here’ and ‘there’. In its idiomatic use, the phrase ‘neither here nor there’ is corrupted to mean indifference or that something (often a choice) does not matter. Taken literally the phrase implies that distance does not differentiate and is of no consequence; locating at one point rather than another is of no moment.

Some notion of distance is also contained in a range of English nouns such as close, near, far, remote and horizon – and in modern colloquialisms such as ‘close in on’. To zoom in and zoom out are contemporary ways of speaking about telescoping, or artificially bringing close what is actually far, and vice versa. Metaphorical phrasings to do with nearness and remoteness obviously trade on notions of distance. ‘So near but so far’ is an ironic saying that parallels (and universalizes) ‘a miss is as good as a mile’. The reference to missing a target – being wide of the mark – works on encouraging people to finalize tasks and work with precision. To stop short is to fail. These expressions resonate with geographical references to journeys, destinations and distances. In these constructions of success and fulfillment, getting there is the thing rather than the journey itself. Similarly, to judge that a presentation or performance is good as far as it goes is to condemn with feint praise. The implication is that the activity has not succeeded as well as it might have; it goes some way, but not a long way, and certainly not far enough. Here, distance is again invoked as accomplished journey. A similar linguistic operation is at work in saying that a performer is far and away the best in a group. To outdistance the competition is to win.

Terms that are less self-evidently related to distance than are ‘far’ and ‘near’ can still be difficult to conceive or comprehend without some prior notion of distance. Examples are proximity, range, reach, centrality, neighbor, core and periphery. Concepts of distance are also embedded in language about spatial processes such as movement and diffusion. The clinical neutrality of these references to distance contrasts with more profoundly valued notions of distance embraced by the terms exile, banishment, deportation, marginalisation and alienation. Here distance has negative connotations. Enemies who are not far enough away, and lovers who are too far apart, also attest to distance being a thing to which value can be attached. Children, swimmers, hikers and strangers in a town are warned not to venture too far. There is not just a vocabulary of distance; there is also a rhetoric of distance.

The references to distance in everyday English occupy a spectrum from bland to emotionally charged. The variety suggests that even outside professional geographical circles distance can be matter-of-fact (as in a street map or atlas), but can also be indeterminate and individualistic. Up to a point distance is what people make of it; it may be as complex and nuanced as one wishes.

Physical distance is perhaps its simplest expression. The artefacts of physical distance include the stage posts that were positioned adjacent to animal-drawn carting and coaching routes in the days of pre-motorized land transport. These stone or wooden distance markers measured the passing of defined stages of a journey, such as halfway. They also might have doubled as indicators of the stages at which teams of horses needed resting or changing. Watering points, stables and inns that were established at such places replaced the knee-high roadside markers. Milestones were an equivalent but more formal measure of location on a route, and a pointer to both the distance traversed and remaining. Physical markers are now part of what might be termed distance heritage. Yet the importance and fascination of marking distance traveled remains: today’s children still want to know with irritating frequency how far it is to a holiday destination. Airline passengers knocked senseless by stress and boredom find comfort gazing at representations of their flight progress on screen displays in passenger cabins: real-time maps show the approximate location of the airliner and digital records measure the distance (and time) flown and the distance (and time) remaining to destination. More poignantly, one imagines that displaced people and refugees fleeing famine and war register acutely their distance from origin and their distance to safety.

The notion of a milestone marking progress is captured by its adaptation as a figure of speech that relates to people’s careers. Long after travel distance could be ‘clocked’ independently by a milometer inside a motor vehicle, and long after road signs erected at junctions would indicate distances in fractional units to people travelling in multiple directions, people still benchmark personal advancement and critical steps in a life and a career by referring to milestones. Attaining a university degree is one such. Becoming a parent is another. Successfully completing a first two-meter high jump would be a milestone in an athlete’s career. Facing up to an awkward telephone call rather than avoiding it would be a milestone in a shy person’s personal development. A parallel speech form would involve talking about a person having come a long way.

Linguistic instances of distance give some insight into the history of dealing with the phenomenon, and also into its complexity. A good example is contained in the word speed. Although the reference to distance is hidden, it is one of two crucial constituents – the other is time. Speed is a measure of the time taken to travel a specified distance. An element of distance is intrinsic to the conception and measure of speed, and to its derivatives, namely,

acceleration, deceleration and momentum. In human geography the idea and metaphor of a shrinking world is inconceivable without some preconception of distance and speed.

The link between distance and time is articulated in other common speech forms, such as phrasings that gauge distance in time units: a friend may be said to live a ten-minute drive away. The statement may reveal ignorance of actual distance. It also presumes that a listener will understand the re-codification by virtue of having been a private vehicle driver or passenger. Timing distance is an effective way of combating the difficulty of sensing distance on journeys that involve disorienting twists and turns. It is also an effective way of gauging the length of walking journeys made without access to a vehicle milometer or a clear map scale. Referring to travel time instead of physical distance is perhaps the most common translation of distance; questions about how far places are apart are often answered in time units. Another instance of distance translation occurs in the context of family trees: a distant relative may be genetically remote, but may live close by. Distance can indeed be ambiguous, both figurative and real.

Dimensions of distance

For most of human history distances have been apprehended, sketched, written and spoken about in vague terms. There is little research on pre-literate representations of distance in cave wall paintings and hieroglyphs, but it appears that distance was a practical concern, a matter for travelers and not a common reference point or a form of general knowledge. Being mobile, or immanently mobile, was the reason to discover or inquire about distance. Measures of distance might be gauged by the reported possibility of reaching a destination before sunset, or by the number of times one slept on a journey. The crudity of these measures resides in the vagueness and individuality of journey speed, and the difficulty of accounting for short nights of sleep that lengthen daylight travel. As modern travelers know, discomfort may indeed index length of journey, but it is not necessarily a reliable or shared measure. Short journeys can be worse than long; travelling the identical distance in different fare class accommodation can be a very different experience.

Other primitive measures of (travel) distance also revert to time as a base. Historically, distance was also recorded in terms of the number of days spent on horseback or the number of weeks spent at sea. In these cases imprecise measurement lies in the variability of equine performance and in the vagaries of wind, currents and sailing technique. Measures of distance were relative rather than absolute, and were imprecise but useful reflections of orders of magnitude.

Impressionistic, individualized and subjective measures of distance have dominated much of human history, notably in pre-literate societies. In the West, efforts to attain a standardized, mathematized and more or less precise measure of distance date at least from Roman times. A Roman unit of distance (called a mile) was defined as the equivalent of 1,000 paces. Variable length of stride would have had made the measure an imperfect and unstable standard. Fractions of a Roman mile were simple to calculate but not always expressed simply: the unit of distance named a stadium was the eighth part of a Roman mile. This was the equivalent of 600 Roman feet (of indeterminate size). In time, the Roman mile became an English mile; a stadium was then made the equivalent of 220 yards; conversions could be approximations and quite arbitrary. The adoption of the statute mile addressed the need to standardize discrepant mile measures in various countries: it was defined as 1,760 yards, longer than the approximately 1,618 yards that constituted the English and Roman miles.

Not only have units of length bearing the same name varied according to period and locality, but human history is also littered with locally unique and purpose-specific distance measures. A furlong (still used on horse racing tracks) was originally equivalent to the length of a furrow in a common field, a site equivalent to a square of ten acres. The persistent problem of internal cross-referencing is clear: the length of one thing depends on another length that also requires definition. Similarly, a furlong was denominated in poles, being equivalent to 40 laid end-to-end. Like the exact length of a pole, the length of each of the 20 measuring rods that constituted a chain could be quite variable. Benchmarks could be quirky, yardsticks less so. Minor differences do not always matter: the base-line precision sought by surveyors, machine engineers, rocket scientists and surgeons is certainly not required by human geographers. For them it is academic that, since 1983, the international standard measure for a meter has been the distance travelled by light in a sealed vacuum in a specified fraction of a second.

Despite unitization and standardization, there is still no single universal measure of geographical distance. Metric measures (meters and kilometers) first adopted in late eighteenth century France had the important feature that they were part of a scale of easily divisible numbers. The elegant system has since been adopted in many countries, but geographic distance is still measured in the clumsier imperial system in countries such as the UK and the USA. Other anomalies exist. The universal measure of distance at sea is the nautical mile. Equivalent to 1,852m (6,087 feet), it is sometimes called a geographical mile and is precisely the length of one degree of arc at the Equator. Conventionally, across the globe, ship speeds are measured in knots, and flying and cloud altitudes are recorded and represented in feet.

Effective distance

Despite the curious and amusing historical-geographical variations in measuring distance, and despite persistent anomalies and inconsistencies, the measurement of geographical distance is simple. There is also a high degree of certainty about the accuracy and comparability of distance measures. Public faith in the measures is high, and they are seldom if ever controversial. But simple distance measures can be misleading. The notion of effective distance adds a layer of complexity that is necessary in some contexts. Effective distance distinguishes between actual geographical line-distance (whether straight-line or on a circuitous route) and the distance that is effectively embedded in a transport network or in a series of journeys. Effective distance is a combined measure: examples are passenger-miles and ton-miles. These compound measures should not be confused with the trademark airline passenger loyalty reward scheme branded as air-miles.

The need to combine distance with a measure of quantity arises most obviously when measuring productivity in the transport industry, especially comparative performances across different networks and organizations. A transport operator (A) whose 100 vehicles traverse 1m km in a year may appear to be making more efficient use of them than operator (B) whose fleet of 100 vehicles cover less distance. But B, who operates an urban transport service, carries more freight and more passengers: multiplying distance by load will show that B may outperform A (who operates long-distance inter-city services) in terms of passenger-miles and freight tonmiles. Effectively, B delivers commodities a greater distance than A; the effective distance covered by A is less.

Whereas they are intended to present a faithful picture of haulage actually accomplished, combinatorial measures involving distance are also open to misunderstanding and manipulation. Corporate reporting can show impressive ton-mile or passenger-km statistics

whose meaning is difficult to grasp intuitively and will always be opaque without any corresponding raw data on distances actually traveled or absolute loads. An impressive ton-mile figure may reflect low loads carried long distances or large loads carried short distances.

Route miles are another common measure of effective distance in the transport industry. In the case of fixed-line transport by rail and tram, for instance, it is often useful to distinguish between track length and route length: the length of single-track infrastructure is half that of a parallel double-track installation but the route length is identical. Comparing only the track lengths of train or tram operators can give a misleading impression of the geographical extent of their services. Track configuration and density is also germane: 1,000km of densely packed double track may service a smaller area than 500km of single track.

Relative distance

Indexes of effective distance emphasize that although line distance is easy to measure and comprehend, it is a simplistic measure. The notion of effective distance also indicates that distance needs to be and can be measured in relation to other elements. Physical distance – sometimes called absolute distance or engineering distance – most certainly does exist, but not all distance is a mere attribute or property of the physical world itself or of its mappings.

Relative distance is similar to effective distance, although it is more intuitive and more widely adopted. The idea that distance is relational does not contradict the sheer physicality of distance. The two can co-exist. The direct or crow-fly distance between two points is a measure of uninterrupted, straight-line distance. The distance by bus or underground train between the same two points is likely to be longer because roads and track wind round or under buildings. In this case, length of route and length of journey exceed the direct distance. The cyclist who cuts across fields and down narrow lanes creates a journey of even shorter distance between the identical two points. These various distances are mediated by the mode of transport; journey length is relative to the type of transport used. In a deltaic or wetland area, the river journey between two villages might be 5km whereas the overland journey is 20km. Whether walking, riding on horseback or motoring, people who choose to use a road between two points are traveling a distance that is route-mediated. This de-naturalized distance is an attribute of the built environment not the natural environment.

Route distance has been the norm for so long in human affairs that it is seldom referred to. The habit contrasts with the unspecified rule for measuring distance as the shortest straight-line interval between two points. But crow-fly distance is never used in tables of distances in road atlases; instead they measure (the most direct) route distance. If route distance has to all intents and purposes become our basic human register of distance, it can not be said that this is an absolute distance. The point about anything absolute is that it is stable. Route distances change, reflecting the construction of new route infrastructure such as a motorway.

Route distance is only one instance of relative distance. Other types of relational distance that fall under the umbrella of technologically-mediated or machine-distances are better known. In 1954 Watson referred to the human factor in distance rather than to any technological consideration, but the distinction is slight. The two best known and most commonly used instances of relative distance are cost distance and time distance. The two indexes are not combinatorial like effective distance. Rather, they are a measure of distance expressed in cost or ticket price on the one hand, and in elapsed journey time on the other.

Time distance

The time taken to cover distance is an extremely common measure of separation or journey length. Time may even be a more common register of geographical distance than physical length. The innumerable occasions on which people refer to a place being a few minutes away, or within an hour's drive, or about a twenty minute walk, or an overnight flight away, reveals a more-or-less universally understood gauge of distance. Precision is not required or expected in such conversations – estimates suffice and orders of magnitude matter most. Units and fragments of time, it appears, are better understood than units of distance; time is visible (on a wristwatch or cell phone) whereas distance can be hard to see and its passing harder to monitor. Distance is easily denominated in minutes and hours.

The re-registration of distance as time is a little surprising given that they are not homologous. Except under controlled conditions, it will seldom if ever be true that some fixed unit of distance traveled invariably equates exactly to a fixed unit of time traveled. Public transport schedules show different travel times for identical journeys: some are non-stop express services, others are all-stops. Variable speeds are also due to variable degrees of traffic congestion and bad weather. Even under the most favorable conditions, topography can mean that the evening bike ride from town takes longer than the morning bike ride into town along the identical route. There is no single time-distance between two places, whereas there is a single straight-line physical distance.

Like other relational distances, time distance is technologically mediated. Generally speaking, advances in transport and telecommunications technology have effectively reduced the geographical distances between places. Over the centuries successively faster forms of transport have moved people and cargos more quickly between places. In the sailing ship era the trans-Atlantic journey was longer than in the succeeding steam ship era. Steaming across the Atlantic made it seem less wide, and New York and London appeared closer. Edinburgh and London became less far apart in terms of time when railway transport became an alternative to overland coaching or coastal sailing. On long-range, one-stop jet service over the North Pole, contemporary flights from Britain to Australia track an entirely different great circle course and take fewer hours than the number of days consumed when banished prisoners were transported by sailing ship round Africa. Similarly, improvements in each distinctive mode of transport have lessened the time taken to reach outlying towns from a city, and vice versa. Trans-continental flights by jet brought Chicago closer to Los Angeles in time-space than when they were served by piston-engine service on the same route. Distances, it appears, are plastic.

It is relatively easy to verbalise and graph the effect of faster transport on time distance, but it is less easy to represent on one map the time-distance convergence between all places. Graphing time-space compression between Paris and one other French town over a century is not difficult. Nor is it hard drawing an isoline map showing how many more places in France were accessible within a two hour journey from Paris in 1990 than in 1950. But these illustrations can not simultaneously also show time-space compression between Lyon and Marseilles. Irrespective of scale, the visualization and depiction of multiple time-space compressions is difficult.

The sophisticated cartographic transformation required is not unlike that involved in redrawing the world map of countries according to their relative population sizes or wealth, for instance. The difficulty in compiling such cartograms is keeping the shape, borders and relative location of countries more or less congruent and recognizable. Distance

transformation is equally unwieldy and problematic, and was not resolved until the 1970s. Since then, a powerful computer-based statistical technique called multidimensional scaling has enabled representation of relative distances between all places in a set. The technique analyses and methodically re-sorts data in a way that expresses the strength of their interrelationships.

The output from multidimensional scaling of time distances is a new mapping of the location of places relative to one another in time-space. Places one hour apart are remapped as closer than places that are close together on the ground but two hours journey apart. Two towns 50km apart but connected only by irregular air service via a remote third town would appear further apart on a time-space map than on a normal map. Map bearings are absent from this newly configured space and the absolute (real world) locations of places are unrecognizably distorted. Although the transpositions are striking, they are not easily understood, so production of time-space maps has been slight and sporadic. No world atlases publish such radical re-views of the world.

Cost distance

Sometimes called economic distance, this measure of relative distance is not as common as time distance. There are certainly no linguistic expressions in English which convey distance in terms of cost. People are not heard conversing about places being two dollars distant, five pounds closer than another place, or three euros further on. One good reason may be the (unpredictable) asymmetry between the price of travel and the distance covered. Ticket pricing on public transport is structured in (increasingly) opaque ways that are not one-to-one or in any other stable ratio to actual journey length. Variable terminal charges, flat zone charging, backhaul charging, and clever marketing are partly responsible. Budget airlines, for example, charge different fares for outbound and inbound flights, and some promotional fares on one leg of a long-haul flight are pitched at less than for a few stops on urban transit.

The extent to which cost-distance calculations enter into locational decision making, commodity delivery and personal travel behavior is not well researched. Commercial travelers, and businesses and corporate divisions that specialize in logistics, do presumably have regard for transport distance configurations that are costly and those that are less so. And it is not inconceivable that private individuals who have detailed knowledge about public transit fares may decide where to rent accommodation or buy a home by costing annual and decade-long savings by living one side of a fare zone boundary rather than at the next station down the line in another fare zone. The introduction of inner-city road-user charging schemes in cities such as Singapore and London will have made motor vehicle users more conscious of cost-distances.

Effort distance

Effort-distance is a little-used construction that may have referred initially only to the physical energy required to move some distance. Over time, the amount of physical energy needed to carry, push, pull, paddle and cycle has been diminished by motorized transport. Nevertheless, there remain many places in the world where consideration of the bodily energy required to move might remain a consideration – where choice of destination is made according to which journey taxes the human body or animal carriers least. The idea of effortless travel punted by airlines and railway and shipping companies clearly takes no account of the irretrievable energy expended in making the vessels and vehicles, or the energy sunk in transport infrastructure.

The criterion of minimizing effort-distance was elevated into a locational principle long before the contemporary alarm and anxiety about depleting energy stocks and the need to conserve energy. The principle might have even more traction now when companies and private individuals seek to minimize their use of fossil fuels and their ecological footprint by traveling less often or less far. In an age of bureaucratized and congested hyper-mobility the notion of effort-distance might also be broadened to encompass the bother and emotion expended on moving between two points. Effort distance re-calibrates real distance against the fuss and strain involved in crossing it. However popular it may be to measure frustration-distance, the multiple subjective and experiential variations involved in measuring and comparing inconvenience render standardization and intelligibility almost impossible. By contrast, expenditure of time and money is more objective.

Cognitive distance

Whereas distance measured relative to time, cost and irritation emphasizes the negative aspects of crossing known physical distance, the notion of cognitive distance brings into question even the salience of true or absolute distance. In keeping with the behavioral revolution that swept through their subject in the 1970s, human geographers queried the assumption that real physical distance (or perfectly known linear distance) was a major consideration in personal or corporate locational and travel decision making. As opposed to omniscient and rational actors in some theoretical universe, real people – so it was observed and suggested – took decisions in relation to their perception of distance to a visible destination, or their cognition of distance to an unseen destination. Exaggerated or underestimated, if either such distance stood in a constant ratio to actual distance, the concern would be immaterial. But interpersonal variations are highly likely; they would probably express socio-economic variations. People with access to private transport may sense distance quite differently to people who are captive users of bus transport and whose urban travel routes meander through suburbs. Both young and elderly people are likely to sense distance from world views unique to their generation: small children from innocence of distances longer than those at home, old people from memories of transport and travel in a by-gone era.

Differences between cognitive and actual distance can emerge through directed interviewing or incidentally through conversation and sketch mapping. The mental maps on which people choreograph their daily activities may lack fidelity, but they do show how accumulated knowledge and limited activity fields distort scale. Under- and over-estimates of distance occur on least traveled routes. On the fringes of behavioral human geography and psychology there is interest in how people acquire and respond to the mind maps that they have of places and of spatial relationships. Research into cognitive mapping provides some insight into how people apprehend and estimate distance, and how mental yardsticks form and change. Imagined distance cannot emerge from nothing.

Affective distance

Felt distance is a close relation of cognitive distance. The difference is that this measure carries an emotional charge. The affectation is mostly the creature of a past and wider world in which the distances that separated people were more significant than in an age of jet travel and voice and image connectivity via telephony and the internet in real time over long distances. Distance mattered more in the past; separations at railway stations and harbors were often permanent and were emotionally taut events. Writers knew the weight of distance, and in classical literature there are frequent references to distancing being associated with lovers missing each other and pining. The first syllable of the word longing is redolent of distance. The cliché about absence making the heart grow fonder approximates some of the

classical allusions. The condition of not being present has qualities of time-distance; unusually, however, distance becomes ambiguous, at once despised and welcomed.

Social distance is another kind of felt distance: it measures the gap between social classes. The social divide between blue collar and white collar workers can not be measured with a ruler. Similarly, the differences between the lives of poor, middle income and rich people are only notionally related to distance. The width and intensity of the barrier between immigrants and locals is gauged better by expressions of xenophobia than by sheer physical distance between the places where they congregate. Yet geographical distance can index social distance. In apartheid South Africa, for example, the distance that the state put between different races by forced residential separation was intended to reinforce and flag social distance. The distances between spontaneously formed ethnic and religious clusters in all cities reflect something of the degree of social division. Distance differentiates.

The significance of distance

The experience of distance as an expression of absence and social difference gives it considerable pungency. These personal registers of distance in public spaces are not ones that have roused many human geographers; their dominant treatment of distance is as an obstacle and a deterrent.

Celebrations of distance as a positive phenomenon are rare. The first syllable of the word even has a negative connotation and, like dislocation and disease, distance is generally unwelcome. Yet there are instances of intentional distancing to attain freedom, progress and peace. Voluntary relocation can be positive, as in putting distance between an aggressor or oppressor and a victim. Many young people choose to escape the conservative and constricting influences in a small town. Isolation is actively sought by some writers and artists and retirees. Selfimposed exile is another instance of regarding and embracing distance as a protective shield.

Instances of positive distancing aside, the ascription of negative effects to distance is overwhelming. Distance is almost entirely regarded and presented as something that enervates action and that attenuates spatial interaction: people lose contact with distant friends and traders focus on nearby markets. The undesirable, energy-sapping effect of distance is captured in the classic but unattributed reference to the friction of distance. The nod to physics suggests that distance has some natural, inherent properties. But physics also teaches that friction can be overcome by judicious lubrication and design engineering. Attributing frictional properties to distance invites solutions to overcoming something unwanted. Viewing distance in negative terms aligns with bombastic terminology about smashing it.

On the human stage, where personification of nature is common, the negativity of distance has been captured most strikingly by allusions to the tyranny of distance. The historian Geoffrey Blainey adopted the phrase as the title of his 1966 book about a key condition of and influence on Australia's past. Five years previously a set of public lectures had reflected on the meaning of and public consciousness about the remoteness and isolation of New Zealand. The notion of tyranny resonates with oppressive power and arbitrary force. The implication is clear that remoteness generates adversity, disadvantage and myopia, and that the requisite travail (the struggle of overcoming distance) is financially costly and can take its toll on human health and life.

Arguing that the destiny of a people and a continent was wrapped up in its antipodean location, Blainey felt able to track Australian development only to the point where distance had been tamed rather than conquered. Efficient transport (which he termed the enemy of distance) had altered much in Australia, but not everything. Distance had been tamed less in people's minds than on maps, he suggested. Some attitudes still belonged to a more isolated era. Blainey's remark that Australians still lived in one of the world's billabongs could cut two ways. Either they continued to behave as if they were still settlers in a land far from British influence, or Australians were in denial of distance and conscientiously reproduced British ways of life in their diasporic community.

By the time he wrote the preface for a revised edition of his book in 1982, Blainey noted that the tyranny of distance had become a catchphrase in Australian political and economic debate. During the last quarter-century of globalization, improvements in transport and communications will have shifted feelings and attitudes of remoteness. Reorientation of Australian affairs and affinities into the Pacific world will have lessened its geographical isolation if not the feeling of isolation. There may be some pride, after all, in accepting and approving the distance that is definitive of a country and a culture.

Distance decay

Possibly the most familiar profiling of distance in human geography has been in studies of its attenuating effects. The term distance decay has long been used to capture diminution due to distance. An example of distance decay is the declining level of aircraft noise away from an airport. In the absence of some other remote source, the occurrence of lead poisoning decreases away from a motorway. Fewer migrating birds reach their destination than started out.

Species diversity intensifies away from the specie-core; exoticism is about distance. As in nature, so too in social affairs the effect of distance is to reduce the intensity of phenomena. More commuters travel short distances than long distances. Attendance at cinemas falls off the further away people live. The degree to which Celtic is spoken and understood diminishes as distance from Ireland, Scotland and Wales increases. The empirical observation of distance decay is nothing new. Mapping the incidence of cholera in Victorian London showed clustering round one contaminated water source. In the mid-nineteenth century an American psychiatrist and statistician noted that use of a medical facility declined with distance away. In the 1930s research into the selection of marriage partners showed that most people met and married people from nearby. A wag once reported moral decay among British expatriates living far from the restraining influences of family, peers and church. As a final example, a shrinking and reconfigured world has always featured in writing about the effects of aviation.

Observation and analysis of numerous instances of distance decay became something of a cottage industry in human geography in the last quarter of the twentieth century. Numerous studies were conducted of the rates of spread and adoption of things such as agricultural practices, of innovations such as television, and of the spatial diffusion of disease by contagion or other means.

Instances of distance decay are no longer clear cut in a globalizing world being changed by cheap travel, telephony and the internet. In the past it would have been easier to claim that radio station listener and newspaper reader numbers taper off from the source of broadcast and publication, that fewer long-distance telephone calls are made than short distance calls,

and that more hamburgers are eaten in the USA than on other continents. Nearby things are no longer always more similar than things far apart. The number of spectators at Wimbledon still falls off rapidly as distance from London increases, but the ratio of Londoners to outsiders and foreigners has probably altered significantly. Certainly, the number of people round the world who watch the tournament live on television exceeds the number of Londoners who do so. Time of day of live broadcast in far-off countries (time-zone distance rather than time distance) affects viewer numbers more than distance from the event.

Scientific study of the way diffusion declines with distance from a source, or how distance lessens spatial interaction between two points, uses mathematical notation and modeling to express attenuation. Starting in the 1960s human geographers drew on Newtonian physics to relate the intensity of trade or movement between an origin and destination to the inverse of their distance apart. In gravity models, distance appears as the denominator in the equation; it is a variable that reduces the volume of interaction between two points whose attraction is measured by the numerator. In keeping with molecular physics, when calibrating a gravity model against observed trip volumes, the distance denominator is generally adjusted by raising it by a power. Typically, physical distance is squared so as to capture the geometric rather than the additive effect that incremental units of distance have on deterrence: people are more than twice as unlikely to travel 40 miles as they are 20 miles. How people regard and weigh distance may be at least as important as sheer physical distance itself. Powering distance mathematically honors the power of (cognitive) distance.

Like most arguments that work with distance as an explanatory variable, gravity models imply that people know distances accurately and are infinitely sensitive to their small variations. Tying behavior to estimated distance – even to distances ranked on a scale of closest to furthest – may capture more accurately how people consider distance. A new grocery store built one hundred meters closer to a housing estate than an existing store will not necessarily deflect customers. Loyalty and anger over the new commercial development may outweigh slight savings in time, shoe leather and petrol. However irrational it appears from an economic point of view (especially if prices at the new store are lower), emotion, habit and reluctance to investigate a new option may mean consumers do not attempt to minimize effort-distance, cost-distance or time-distance. The marginal benefits, tested or guessed, real or perceived, might just be too small.

Decaying distance

The term distance decay refers to decay by distance and not to the decay of distance. Yet claims do erupt periodically about the demise of distance. Cognizant of the shrinking world, it is reasonable to argue that distance has for some time had diminishing significance in human affairs.

In ancient history, when technologies of transport and communication were rudimentary, distance had extraordinary significance. In non-industrial societies, distance was an almost insurmountable barrier and, in consequence, mythical qualities were ascribed to distance. To travel beyond the visible horizon was not just to journey a long distance, it was to reach the conjunction of earth and sky. There, elite politico-religious adventurers were believed to have either encountered the past (beginnings and ancestors) or to have seen and experienced the future (utopias, afterlife). Observers and travelers alike vested distance with symbolic power. Cosmological distance was associated with mystery and the supernatural, and long-distance travel with the acquisition and exercise of power and knowledge. Distant lands and people were sources of esoteric knowledge and exotic material wealth. The ability to overcome

distance was a sign of power, ability, wisdom and work; to conquer distances was to obtain religious grace.

The contemporary world retains little faith in such meaningful distances. The demystification of distance has been followed by its romanticization. Tourism discourse, for example, advertises that the grass is greener elsewhere, that the beaches are whiter, the sun warmer, and time less pressured. In a virtual world, references to distance are figurative rather than literal, and the debate now is not about the significance of physical distance but about its insignificance. In a globalizing world that appears to be shrinking, distance can not retain the same force it did ten years ago, let alone a century ago or a thousand years ago. Technologies of transportation and communication have created a global village where everything seems close and nothing far. Notices about the death of distance echo populist claims about the end of geography, the annihilation of space, and the flattening of the world.

These catchy assertions work with notions of relative distance rather than absolute distance and do not claim that the Earth itself is shrinking. There is no contention that absolute distance does not exist, but it is argued that distance is not entirely elemental. The claims about the shrinking world point to the passing of distance as a material consideration in human affairs. The claims move away from the presumption that distance is merely a property of and an object embedded in the physical world. The objectification and reification of distance in the natural world is countered by a different paradigmatic view in human geography which stresses that distance (and proximity) is a relational entity. But geographical distance is not just a technical determination either, fabricated by and in thrall to the speed and price of (virtual) mobility. Postpositivist geographers regard distance as being a human construction, endlessly fashioned and shaped by human agency and not just by machines. As the pre-industrial case shows, and as cognitive mapping demonstrates, distance is also an idea. And, in the new mobilities paradigm, distance is coming to be problematized as a residue of codifications, activities, experience, imagination and memory. Any universalizing and standardizing of distance strips away its rich cultural, personal and institutional associations. Reductive and essentializing representations of distance may strip away its abstraction and baffling complexity, but they denude it of meanings that are socially constructed, negotiated and contested.

In addition to concealing layers of distance making, catchy claims about the demise of distance fail to deal with the nuances of contemporary spatial reconfiguration: the world is not shrinking uniformly, and de-distanciation is accompanied by re-distanciation of places in plastic spaces. Not all communities feel the taming of distance let alone its destruction. The aptness of the shrinkage metaphor is open to question when it is so uneven; instead, the world map might be regarded as bending and twisting. A contorting world is moulding new global peripheries. Marginalization occurs at places that are eclipsed despite being relatively near the world's economic hubs. Forty years after being written, the final sentence in economist Wilfred Owen's book on Distance and Development may be truer than ever. Resorting to a common expression that uses figurative distance to convey degree, he concluded that distance and isolation went a long way to explaining the poverty and stagnation of eighty percent of humanity.

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Nomenclature

Distanciation: the process of distancing or separating places, people or things from one another