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# Prospect, perspective and the evolution of the landscape idea

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## ABSTRACT

The landscape concept in geography has recently been adopted by humanistic writers because of its holistic and subjective implications. But the history of the landscape idea suggests that its origins lie in the renaissance humanists' search for certainty rather than a vehicle of individual subjectivity. Landscape was a 'way of seeing' that was bourgeois, individualist and related to the exercise of power over space. The basic theory and technique of the landscape way of seeing was linear perspective, as important for the history of the graphic image as printing was for that of the written word. Alberti's perspective was the foundation of realism in art until the nineteenth century, and is closely related by him to social class and spatial hierarchy. It employs the same geometry as merchant trading and accounting, navigation, land survey, mapping and artillery. Perspective is first applied in the city and then to a country subjugated to urban control and viewed as landscape. The evolution of landscape painting parallels that of geometry just as it does the changing social relations on the land in Tudor, Stuart and Georgian England. The visual power given by the landscape way of seeing complements the real power humans exert over land as property. Landscape as a geographical concept cannot be free of the ideological overlays of its history as a visual concept unless it subjects landscape to historical interrogation. Only as an unexamined concept in a geography which neglects its own visual foundations can landscape be appropriated for an antiscientific humanistic geography.

**KEY WORDS:** Landscape, Geometry, Perspective, Prospect, Humanism, Ideology, Graphic image, Cartography, Painting, Seeing, Chorography, Morphology, Survey, Space.

Geographical interest in the landscape concept has seen a revival in recent years. In large measure this is a consequence of the humanist renaissance in geography. Having enjoyed a degree of prominence in the interwar years, landscape fell from favour in the 1950s and 1960s. Its reference to the visible forms of a delimited area to be subjected to morphological study (a usage still current in the German 'landscape indicators' school)<sup>1</sup> appeared subjective and too imprecise for Anglo-Saxon geographers developing a spatial science. The static, descriptive morphology of landscape ill-suited their call for dynamic functional regions to be defined and investigated by geographers contributing to economic and social planning.<sup>2</sup>

Recently, and primarily in North America, geographers have sought to reformulate landscape as a concept whose subjective and artistic resonances are to be actively embraced. They allow for the incorporation of individual, imaginative and creative human experience into studies of the

geographical environment, aspects which geographical science is claimed to have devalued at best and at worst, ignored. Marwyn Samuels, for example,<sup>3</sup> refers to landscapes as 'authored', Courtice Rose thinking along similar lines would analyse landscapes as texts,<sup>4</sup> and Edward Relph regards landscape as 'anything I see and sense when I am out of doors—landscape is the necessary context and background both of my daily affairs and of the more exotic circumstances of my life'.<sup>5</sup> American humanist geographers have adopted landscape for the very reasons that their predecessors rejected it. It appears to point towards the experiential, creative and human aspects of our environmental relations, rather than to the objectified, manipulated and mechanical aspects of those relations. It is the latter against which humanism is a protest, which Relph traces to the seventeenth century scientific revolution and its Cartesian division of subject and object. Landscape seems to embody the holism which modern humanists proclaim.

In Britain a revival of landscape is also apparent. Here the humanist critique in geography has been less vocal. Recent landscape study has remained closer to popular usage of the word as an artistic or literary response to the visible scene.<sup>6</sup> Among British geographers interest in landscape was stimulated partly by perception studies, particularly the short-lived excitement over landscape evaluation for planning purposes which surrounded the 1973 reform of local government.<sup>7</sup> This led to various mechanistic theories of landscape aesthetics which, like Jay Appleton's ethologically-founded and influential 'habitat theory' of landscape,<sup>8</sup> had little in common with the humanism proclaimed in North American studies.

Epistemological divergence notwithstanding, landscape is again a focus of geographical interest. With that interest has come a refreshing willingness by geographers to employ landscape representations—in painting, imaginative literature and garden design—as sources for answering geographical questions.<sup>9</sup> The purpose of this paper is to support and promote that initiative while simultaneously entering certain caveats about adopting the landscape idea without subjecting it to critical historical examination as a term which embodies certain assumptions about relations between humans and their environment, or more specifically, society and space. These caveats go beyond landscape as such and touch upon aspects of the whole humanist endeavour within geography.

Landscape first emerged as a term, an idea, or better still, a *way of seeing*<sup>10</sup> the external world, in the fifteenth and early sixteenth centuries. It was, and it remains, a visual term, one that arose initially out of renaissance humanism and its particular concepts and constructs of space. Equally, landscape was, over much of its history, closely bound up with the practical appropriation of space. As we shall see, its connections were with the survey and mapping of newly-acquired, consolidated and 'improved' commercial estates in the hands of an urban bourgeoisie; with the calculation of distance and trajectory for cannon fire and of defensive fortifications against the new weaponry; and with the projection of the globe and its regions onto map graticules by cosmographers and chorographers, those essential set designers for Europe's entry centre-stage of the world's theatre. In painting and garden design landscape achieved visually and ideologically what survey, map making and ordinance charting achieved practically: the control and

domination over space as an absolute, objective entity, its transformation into the property of individual or state. And landscape achieved these ends by use of the same techniques as the practical sciences, principally by applying Euclidian geometry as the guarantor of certainty in spatial conception, organization and representation. In the case of landscape the technique was optical, *linear perspective*, but the principles to be learned were identical to those of architecture, survey, map-making and artillery science. The same handbooks taught the practitioners all of these arts.<sup>11</sup>

Landscape, like the practical sciences of the Italian Renaissance, was founded upon scientific theory and knowledge. Its subsequent history can best be understood in conjunction with the history of science. Yet in its contemporary humanist guise within geography, landscape is deployed within a radically anti-scientific programme. Significantly that programme is equally non-visual. Recent programmatic statements of geographical humanism (and critiques of it) in the pages of these *Transactions* are notable for their concentration on verbal, literary and linguistic modes of communication and for their almost complete neglect of the visual and its place in geography.<sup>12</sup> The attack on science is characteristic of much contemporary humanist writing. But the apparent lack of interest in the graphic image is more surprising. Consider the traditions of our discipline, its alignment with cartography and the long-held belief that the results of geographical scholarship are best embodied in the map. Consider too the humanists' proclaimed interest in *images* of place and landscape, and yet their remarkable neglect of the visual.<sup>13</sup> Indeed the clearest statement of the centrality of sight in geography that I know is found in William Bunge's *Theoretical Geography*, a manifesto for spatial science: 'geography is the one predictive science whose inner logic is literally visible'.<sup>14</sup> Bunge's book may be closer in spirit to the original humanist authors of the landscape idea than his contemporary humanist critics. The book after all is a celebration of the certainty of geometry as the constructional principle of space.

In fact, the humanist attack on science and its neglect of the visual image in geography are not unconnected. They both result in some measure from the lack of critical reflection on the European humanist tradition, from the conflation of the spatial theme in geography with a positivist epistemology, and from a mystification of art and literature. All three of these aspects will be illustrated in a brief

exploration of the landscape idea as a way of seeing in the European visual tradition, emphasizing that tradition's most enduring convention of space representation, linear perspective. In this exploration I shall justify and elaborate the claim that the landscape idea is a visual ideology; an ideology all too easily adopted unknowingly into geography when the landscape idea is transferred as an unexamined concept into our discipline.

### GEOMETRY, PERSPECTIVE AND RENAISSANCE HUMANISM

Traditionally the seven liberal arts of medieval scholarship were grouped into two sets. The trivium was composed of grammar, rhetoric and logic; the quadrivium of arithmetic, geometry, astronomy and music. While in its narrowest definition humanism referred to studies in the trivium (the recovery, secure dating and translation of texts), many early renaissance humanists were equally fascinated by the material of the quadrivium, seeking a unity of knowledge across all the arts.<sup>15</sup> The fifteenth century saw revolutionary advances in both sets of studies, advances which altered their organization, social significance and role in the production and communication of human knowledge of the world and our place within it. In the arena of words, language and written expression the most striking advance was the

Gutenberg invention of movable type in the 1440s.<sup>16</sup> In the quadrivium, always more theoretical, the critical advance came from the re-evaluation of Euclid and the elevation of geometry to the keystone of human knowledge, specifically its application to three-dimensional space representation through single-point perspective theory and technique. Perspective, the medieval study of optics, was one of the mathematical arts, studied since the twelfth-century revival of learning, as evidenced for example in Roger Bacon's work. Painters like Cimabue and Giotto had constructed their pictures in new ways to achieve a greater realism (*il vero*) than their predecessors.<sup>17</sup> But the theoretical and practical development of a coherent linear perspective awaited the fifteenth-century Tuscan Renaissance. That movement, despite its emphasis on classical texts, grammar and rhetoric, revolutionized spatial apprehensions in the west. For the plastic and visual arts: painting, sculpture and architecture, and for geography and cosmology, all concerned with space and spatial relations, it was from the quadrivium, from geometry and number theory, that form and structure were determined—even if their content was provided by the trivium.

In 1435 the Florentine humanist and architect Leon Battista Alberti published his *Della Pittura* (*On*

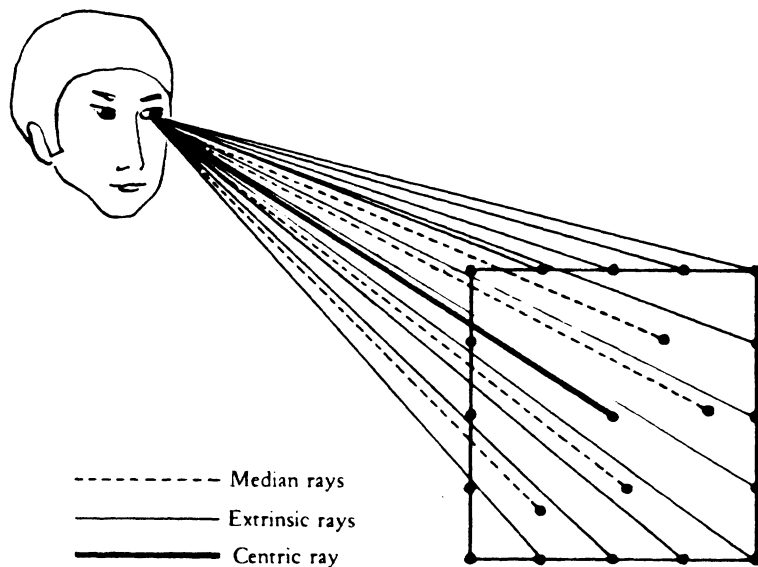


FIGURE 1. The visual triangle as described by Alberti (from Samuel Y. Edgerton Jr, *The Renaissance rediscovery of linear perspective*, Harper and Row, London, 1975, reproduced with permission)

painting),<sup>18</sup> a work whose authority in artistic theory endured beyond the eighteenth century when Sir Joshua Reynolds, first president of the Royal Academy, used it as the foundation for his lectures on pictorial composition, beauty and the hierarchy of genres. In *Della Pittura* Alberti demonstrates a technique which he had worked out experimentally for constructing a visual triangle which allowed the painter to determine the shape and measurement of a gridded square placed on the ground when viewed along the horizontal axis, and to reproduce in pictorial form its appearance to the eye. The *costruzione leggitima* gave the realist illusion of three-dimensional space on a two-dimensional surface. This construction, the foundation of linear perspective, depended upon concepts of the vanishing point, distance point and intersecting plane. Alberti describes it as a triangle of rays extending outwards from the eye and striking the object of vision. There are three kinds of ray (Fig 1).

The extrinsic rays, thus circling the plane—one touching the other, enclose all the plane like the willow wands of a basket cage, and make... the visual pyramid. It is time for me to describe what the pyramid is and how it is constructed by these rays... The pyramid is a figure of a body from whose base lines are drawn upward, terminating at a single point. The base of the pyramid is the plane which is seen. The sides of the pyramid are the rays which I have called extrinsic. The cuspid, that is the point of the pyramid, is located within the eye where the angle of the quantity is.<sup>19</sup>

The visual pyramid here described is familiar to every geographer who reads *Area*, although its geographical significance may not always be fully

appreciated (Fig 2). We need not concern ourselves here with the details and accuracy of Alberti's construction (except perhaps to note the definition of pyramid, lifted directly from Euclid). But we should observe certain consequences that flow from it. First, form and position in space are shown to be relative rather than absolute. The forms of what we see, of objects in space and of geometrical figures themselves, vary with the angle and distance of vision. They are produced by the sovereign eye, a single eye, for this is not a theory of binocular vision. Secondly, Alberti regards the rays of vision as having origin in the eye itself, thus confirming its sovereignty at the centre of the visual world. Thirdly, he creates a technique which became fundamental to the realist representation of space and the external world. The artist, through perspective, establishes the arrangement or composition, and thus the specific time, of the events described, determines—in both senses—the 'point of view' to be taken by the observer, and controls through framing the scope of reality revealed. Perspective technique was so effective that the realist conventions which it underlay were not fundamentally challenged until the nineteenth century.<sup>20</sup>

Realist representation of three-dimensional space on a two-dimensional surface through linear perspective directs the external world towards the individual located outside that space. It gives the eye absolute mastery over space. The centric ray moves in a direct line from the eye to the vanishing point, to the depth of the recessional plane. Space is measured and calculated from this line and the rest of what is seen constructed around the vanishing point and within the frame fixed by external rays.

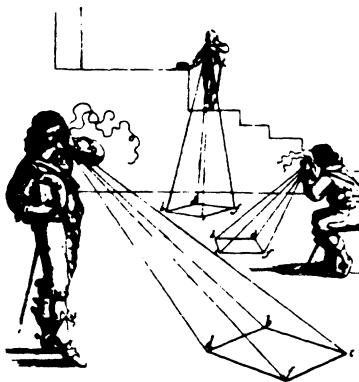


FIGURE 2. A seventeenth-century 'way of seeing' (familiar to readers of *Area*)

## Observation



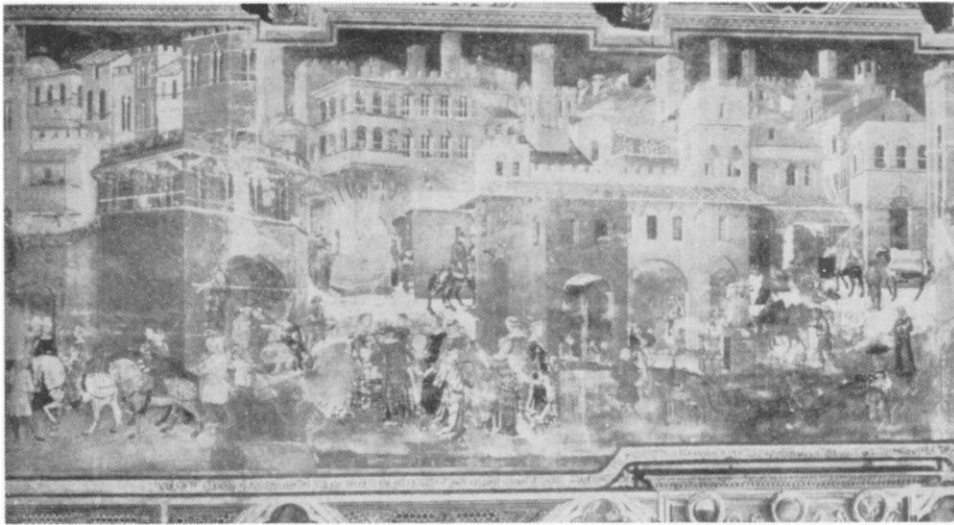


FIGURE 3. Ambrogio Lorenzetti: 'Good Government in the City' detail from Palazzo Pubblico, Siena (ditta O. Böhm)

Visually space is rendered the property of the individual detached observer, from whose divine location it is a dependent, appropriated object. A simple movement of the head, closing the eyes or turning away and the composition and spatial form of objects are altered or even negated. Developments from the fifteenth century may have altered the assumed position of the observer, or used perspective analytically rather than synthetically as Alberti and his contemporaries intended,<sup>21</sup> but this visual appropriation of space endured unaltered. Significantly, the adoption of linear perspective as the guarantor of pictorial realism was contemporary with those other realist techniques of painting: oils, framing and production for a market of mobile, small canvases. In this respect perspective may be regarded as one of a number of techniques which allowed for the visual representation of a bourgeois, rationalist conception of the world.

The term bourgeois is appropriate, for linear perspective was an urban invention, employed initially to represent the spaces of the city. It was first demonstrated practically by Alberti's close associate, Filippo Brunelleschi, in a famous experiment of 1425 when he succeeded in throwing an image of the Baptistery at Florence onto a canvas set up in the great portal of the cathedral.<sup>22</sup> If we compare Ambrogio Lorenzetti's well-known frescoes in the Palazzo Pubblico at Siena (Fig 3) which represent good government in the city, painted in the 1340s, with Peitro Perugino's representation of *Christ giving to St*

*Peter the Keys to the Kingdom of Heaven* (Fig 4) painted on the wall of the Sistine Chapel in 1481, the significance of perspective is clear. Lorenzetti shows us the city as an active bustling world of human life wherein people and their environment interact across a space where unity derives from the action on its surface.

These pre-perspective urban landscapes show not so much what the towns looked like as what it felt like to be in them. We get an impression of the towns not as they might have looked to a detached observer from a fixed vantage point but as they might have impressed a pedestrian walking up the streets and seeing the buildings from many different sides.<sup>23</sup>

By contrast, in Perugino's ideal city a formal, monumental order is organized through precise geometry, constructed by the eye around the axis which leads across the chequerboard piazza to the circular temple at its centre. The piazza, geometrical centre of this city, becomes in this genre symbolic of the whole city.<sup>24</sup> The hills and trees beyond reflect the same regimented order as the urban architecture. The people of the city, or rather within it, for they reveal no particular attachment to it, group themselves in dignified and theatrical poses. In the 'ideal townscapes' of the late fifteenth-century Umbrian school of Piero della Francesca humans scarcely appear. They have no need to for the 'measure of man', so neatly captured in Leonardo da Vinci's *Man in a Circle and a Square*, is written into the measured



FIGURE 4. Pietro Perugino: 'Christ giving to St Peter the Keys to the Kingdom of Heaven' Vatican City, Sistine Chapel (ditta O. Böhm)

architectural façades and proportioned spaces of the city, an intellectual measure rather than sensuous human life.<sup>25</sup> This alerts us to the fact that perspective and its geometry had a greater significance than merely its employment as a painting technique.

The mathematics and geometry associated with perspective were directly relevant to the economic life of the Italian merchant cities of the Renaissance, to trading and capitalist finance, to agriculture and the land market, to navigation and warfare. Michael Baxandall<sup>26</sup> has shown that merchants attending the *abbaco* or commercial school in their youth undertook a curriculum which provided the key skills of mathematics for application in commerce: accounting, book-keeping, calculation of interest and rates of return, determining proportions in joint risk ventures. One of the most commonly used tests summarizing the various merchant skills was Fra Luca Pacioli's *Summa di Arithmetica, Geometria, Proportionione et Proportionalità* (1494).<sup>27</sup> Its author, a close friend of Leonardo, acknowledges Alberti as well as Ptolemy and Vitruvius, and of course Euclid among his sources. While Piero della Francesca had himself written an earlier text, *De Abbaco*, Pacioli's was the first complete manual of practical mathematics to

appear in printed book form, following only two years after the first printed geometry and setting the model for a collection of later texts. Pacioli devotes the second book of the volume to geometry and the measurement of distance, surface and volume. He points out the value of such skills for land survey and map making, for warfare and navigation. From a text like this Italian merchants learned to calculate visually or 'gauge' by eye and using  $\pi$  the volume of a barrel, a churn, a haystack or other regular shape, a valuable skill in an age before standard sizes and volumes became the norm. This visual gauging was regarded as a wonderful skill. In the words of Silvio Belli writing of visual survey in 1573: 'certainly it is a wondrous thing to measure with the eye, because to everyone who does not know its rationale it appears completely impossible.'<sup>28</sup> It has been argued that the search for accurate visual techniques of land survey held back Italian innovations in instrumentation for many decades,<sup>29</sup> but the significance accorded to it indicates the importance attached to the power of vision linked to intellect through geometry, and how the principles which underlay perspective theory were the everyday skills of the urban merchant.

Not all land survey was by eye. The astrolabe, quadrant and plane table were in use and discussed in the texts cited. For map makers and navigators these were crucial instruments. But they required geometrical calculation to make their results meaningful. The Italian renaissance was a cartographic as much as an artistic event. Ptolemy whose *Almagest* had always ranked as a key geometrical source became known too for his *Cosmografia*, brought as a Greek text to Florence at the beginning of the fifteenth century. Alberti produced an accurately surveyed map of Rome, Leonardo one of Pavia. These were regarded as revelations of the rational order of created space produced by the application of geometry. Perhaps more closely related to landscape painting was the *pianta prospettiva*, the bird's eye view of cities which became so popular at the turn of the sixteenth century. Among the best known of these is Jacopo de 'Barbari's 1500 map of Venice, like so many of its type as much an ideological expression of urban dominion as an accurate rendering of the urban scene.<sup>30</sup> The viewpoint for these maps is, significantly, high above the city, distant, commanding, uninvolved. It is the same perspective that we find in Bruegel's or Titian's landscapes, panoramas over great sweeps of earth space, seas, mountains and promontories.

Linear perspective organizes and controls spatial coordinates, and because it was founded in geometry it was regarded as the discovery of inherent properties of space itself.<sup>31</sup> In this, perspective had a deeper cultural significance, as Pollaiuolo's bas-relief of *Prospettiva* as a nubile goddess, sculpted on the tomb of Sixtus IV in 1493 might suggest. One of the earliest and most widely influential of the Renaissance thinkers, the Paduan humanist Nicholas of Cusa, theologian, cosmographer and mathematician, challenged the Aristotelian scholastic world view in his *De Docta Ignorantia* of 1440 by appeal to the Euclidean geometry.<sup>32</sup> Rejecting the idea that there could be no empirical knowledge of the spiritual sphere by men confined to the temporal, and thus no direct knowledge of God, Cusanus proclaimed the significance of indirect evidence in a neoplatonic sense. He pointed out that in the infinitely large circle the circumference and tangent coincide in a straight line while the infinitely small circle was a point. This is the foundation of a continuous geometry relating all Euclid's separate propositions and giving forms a qualitative as well as quantitative character.<sup>33</sup> Equally, it gave support to Cusanus' argument for a pattern running through all

creation in which God was to be found at the centre and circumference of the cosmos. A regular geometry proceeding from the perfection of the circle underlay the structure of both spiritual and temporal worlds. Geometry and proportion took on therefore a metaphysical significance, one that was given even greater weight with the translating and misdating of the *Corpus Hermeticum* by Marsilio Ficino in 1464 and the introduction of cabalist number theory by Pico della Mirandola in 1486.<sup>34</sup> The circle, the golden section, the rule of threes, all of them part and parcel of the intellectual and practical baggage of the Renaissance merchant, sailor, surveyor and chartmaker, could be related to the most erudite metaphysical speculation. Above all it was the human intellect, human reason, that could apprehend this significance and seek the certainties of geometry. And the human body, created in the image and likeness of God, replicated in microcosm the divine proportions, as Leonardo's human figure enclosed in divine geometry makes clear. At the centre of Renaissance space, the space reproduced by perspective, was the human individual, the measure of his world and its temporal creator and controller. Like God, the microcosm, man, also appears at the circumference of Renaissance space, high above the globe, seeing it spread before the sphere of his eye in perspective on the map, the *pianta prospettiva* or the panoramic landscape.

The authority attributed to man<sup>35</sup> was exercised in a hierarchy that was at once spatial and social, a hierarchy in which the landscape idea played a significant, if subordinate role. Referring to architecture, the 'queen of the arts', Alberti discusses the decoration suitable to different buildings:

Both paintings and poetry vary in kind. The type that portrays the deeds of great men, worthy of memory, differs from that which describes the habits of private citizens and again from that depicting the life of the peasants. The first, which is majestic in character, should be used for public buildings and the dwellings of the great, while the last mentioned would be suitable for gardens, for it is the most pleasing of all. Our minds are cheered beyond measure by the sight of paintings, depicting the delightful countryside, harbours, fishing, hunting, swimming, the games of shepherds—flowers and verdure.<sup>36</sup>

The reference is to the genres of painting which replicate those of poetry: from the most elevated, *storia* (epic or historic events), to portraiture and domestic scenes, and finally the least serious,



landscapes and rural scenes. Geographically, the centre of the city, where public buildings and monuments adorn the main piazza, is the setting for great men and should record their epic deeds. In the urban palaces and private houses of the patriciate appear portraits and family groups while in the countryside, far away from and subordinate to the power at the heart of the city, the peasants—'beasts of the villa'—disport themselves in their rude manner, while gentlemen relax, follow appropriate leisurely pursuits and enjoy the beauty of nature.<sup>37</sup> In the theatre, whose auditorium design, spatial arrangements and stage sets were exercises in applied geometry and perspective construction—even cosmological theory<sup>38</sup>—this hierarchy was carefully articulated for the three forms of drama. Tragedy was played against settings of the ideal city and its monumental architecture, romance in the palace interior or closed garden, and comedy or farce in the sylvan setting of a rural landscape. Control and power radiate down a socio-spatial hierarchy along the orthogonal lines reaching out from the piazza of an ideal city to transect recognizably distinct landscape types.

## LANDSCAPE, PERSPECTIVE AND REALIST SPACE

It is known that the first artist references to specific paintings as 'landscape' (*paesaggio*) come from early sixteenth-century Italy. One of the most often quoted is that from 1521 referring to Giorgione's *Tempesta*.<sup>39</sup> Both Kenneth Clark and J. B. Jackson, in discussions of landscape in this period, sense a relationship between the new genre and notions of authority and control. Noting the appearance of 'realist' landscape in upper Italy and Flanders, the second mercantile core of early modern Europe, Clark claims that it reflected 'some change in the action of the human mind which demanded a new nexus of unity, enclosed space,' and suggests that this was conditioned by a new, scientific way of thinking about the world and an 'increased control of nature by man'.<sup>40</sup> Jackson refers to a widespread belief that the relationship between a social group and its landscape could be so expertly controlled as to make appropriate a comparison between environmental bonds and family bonds,<sup>41</sup> thereby allowing landscape to become a means of moral commentary. Perspective was the central technique which allowed this control to be achieved in the new paintings of landscape. In Leonardo's writings the

importance of perspective is in no doubt: 'for Leonardo, as for Alberti, painting is a science because of its foundation on mathematical perspective and on the study of nature'.<sup>42</sup> Leonardo himself wrote that

Among all the studies of natural causes and reasons light chiefly delights the beholder—and among the great features of mathematics the certainty of its demonstrations is what pre-eminently tends to elevate the mind of the investigator. Perspective must therefore be preferred to all the discourses and systems of human learning.<sup>43</sup>

Geometry is the source of the painter's creative power, perspective its technical expression. For Leonardo, perspective 'transforms the mind of the painter into the likeness of the divine mind, for with a free hand he can produce different beings, animals, plants, fruits, landscapes, open fields, abysses and fearful places'.<sup>44</sup> Linear perspective provides the certainty of our reproductions of nature in art and underlies the power and authority, the divine creativity of the artist.

Leonardo, despite these comments and his mapping experiments, is not remembered as a landscape painter, although his geographical contributions were by no means meagre.<sup>45</sup> More interesting from this point of view is the work of the Venetian Christoforo Sorte in the later Renaissance. Sorte was a cartographer and surveyor, employed by the Venetian republic as one of the 'periti' or land surveyors and valuers of the *Provveditori sopra i beni inculti*, the reclamation office which supervised marshland drainage and dryland irrigation in the second half of the sixteenth century. He was a skilled cartographer whose maps are regarded as being among the finest records of the Venetian state at this time (Fig 5).<sup>46</sup> Sorte was also a landscape painter who has left us a remarkable treatise on his art<sup>47</sup> in the form of a reply to a letter from a Veronese noble, Bartolomeo Vitali, requesting information on how Sorte had succeeded in reproducing

the true green of the pastures, the variety of the flowers, the range of green plants, the density of the forests, the transparency of water... the distances of perspectives.<sup>48</sup>

The work that Vitali refers to is sadly unknown. But from textual evidence it is clearly part-map part-landscape drawing: a chorography in plan and perspective of the province of Verona, carefully

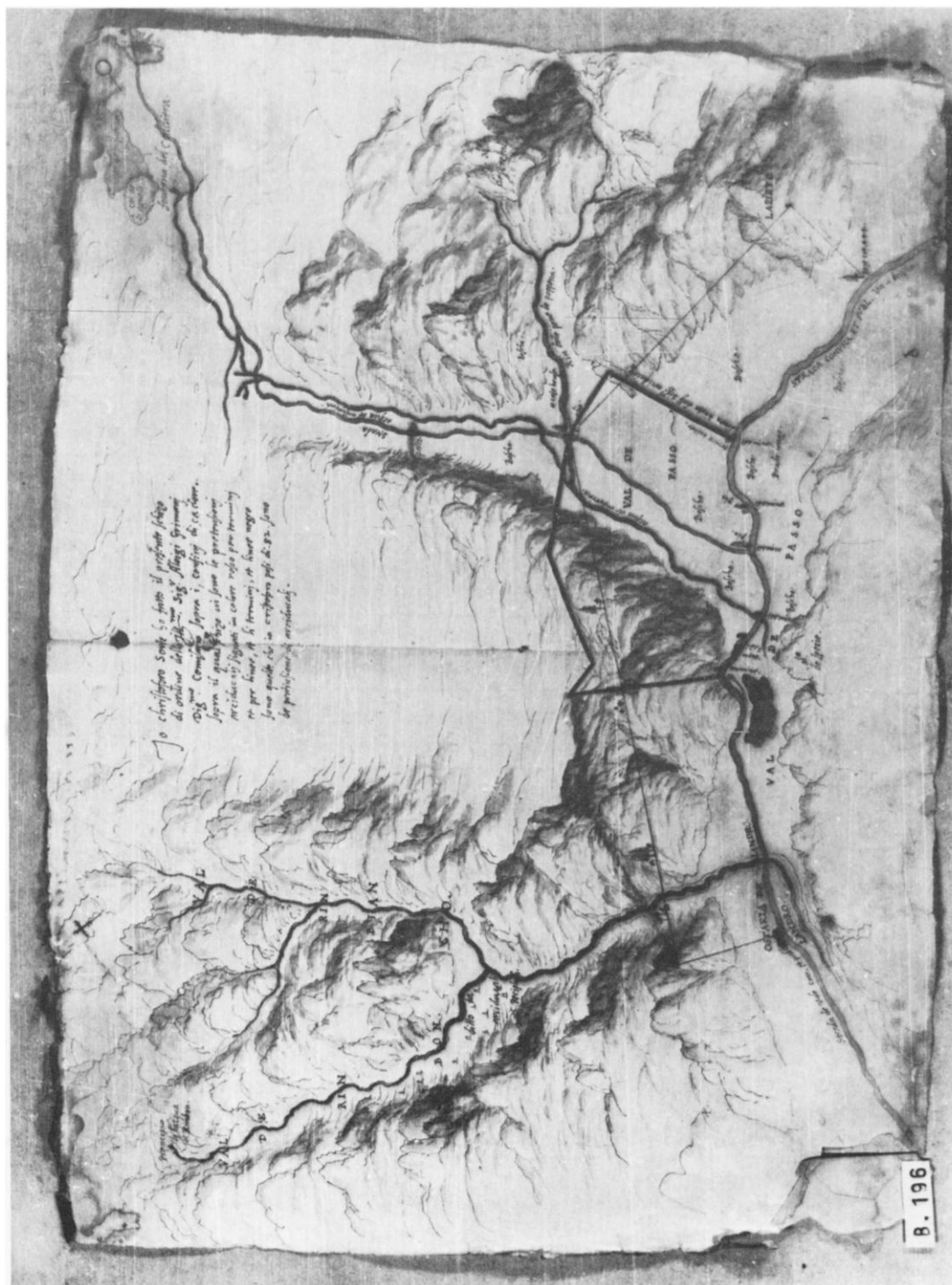


FIGURE 5. Christoforo Sorte: Map of Venetian boundaries at Cadore (Venice, Archivio di Stato, Provv. Camera dei Confini, B196/13)

coloured and considered a work of art. Sorte, in his reply, modestly refers to himself as merely a practical man (*un puro pratico*) rather than a philosopher or an artist. He is a *chorographer*. But his chorography is securely based in science. From Ptolemy's *Cosmographia* he has learned how to organize his map according to the four cardinal points, and he has 'located the said chorography with its true relations and distances on the map'.<sup>49</sup> Once these geometrical essentials are completed he can discuss the colouring of the map. Colours are used partly to avoid too many words, partly to produce a representation of reality. Thus different shades of green allows us to recognize fertile and infertile lands and forests. The careful and observant use of colour helps us to 'create the image of a landscape (*paese*) on canvas in gouache and according to perspective'. Indeed the text ends with a discourse on perspective, of which Sorte describes two methods, one theoretical founded in distance and angle measurement and a second, more practical, for which he employs a mirror marked with a graticule. For Sorte perspective is 'the foundation of painting' without which nothing can be painted of any value. And this skill of painting is itself fundamental to the work of the chorographer: 'niuna potra esser corografo, che non sappia disegnare o dipingere'.<sup>50</sup>

The relationship between perspective and landscape could scarcely be more clear than in Sorte's text where the practical surveyor and topographer offers one of the earliest treatises on the art of painting landscape. The early twentieth-century art historian Bernard Berenson agreed with Sorte. 'Space composition' he wrote, is the 'bone and marrow of the art of landscape'. Referring to the early Umbrian landscapists Pietro Perugino and Raphael, Berenson claimed their triumph lay less in the subtle modelling of atmosphere and elaborate study of light and shade such as we find in the Venetians than in the technique of space composition. Although Berenson speaks of this ability to compose space as 'a structure of feeling' rather than a specific technique based on sophisticated geometrical theory, he is well aware of that sense of power and control over space that the spectator derives from the perspective organization of landscape painting:

in such pictures, how freely one breathes—as if a load had just been lifted from one's breast, how refreshed, how noble, how potent one feels.<sup>51</sup>

No longer is the spectator delighted only by surface pattern and the arrangement of forms across two

dimensions, but rather exhilarated by the potency of extension in depth, a controlled, axial entry into the picture plane achieved by linear perspective. This is the achievement of all the great landscapists, of Bruegel's and Titian's cosmic panoramas, of Giovanni Bellini's carefully located figures and modulated bands of light and shade, of Claude's stage-like wings, coulisses and recessional planes along the axis, and of J. M. W. Turner—himself Professor of Perspective at the Royal Academy—who once claimed that 'without the aid of perspective, all art totters on its very foundations'.<sup>52</sup>

Perspective then is critical to landscape painting, and it is significant, if beyond the scope of this paper to explore in detail, how close are the historical parallels between the great advances in perspective geometry and innovations in landscape art. Alberti wrote his treatise at the time of Van Eyck and the earliest Italian landscapists; Pelerin, who refined the distance point construction in 1505 was the contemporary of Leonardo and Giorgione; Vignola who showed in 1535 that Pelerin and Alberti's construction produced the same geometrical results wrote at the time of Titian's and Bruegel's maturity and was published in the productive years of Paolo Veronese and Jacopo Bassano. The great advances of Pascal and Desargues in the 1630s in establishing the convergence of parallel lines and showing their apparent visual convergence to be a necessary consequence of point, line and surface definitions devoid of Euclidian metrical assumptions, coincide with the Dutch supremacy in optics and its great school of landscape. Geometrical continuity and new transformational rules between geometrical forms are propounded in a treatise by Poncelet written at the same time that Constable and Turner were exploring light and atmosphere in landscape in ways that implicitly challenged the dominance of linear perspective for space composition. Finally von Staud in the 1840s eliminated metrical ideas from perspective geometry, revealing the possibility of a non-Euclidian space and n-dimensional constructions. His work was completed by F. Klein in 1875 a little before modernists eliminated perspective from space composition and at the same time as the first patents were taken out for modern photographic printing techniques.<sup>53</sup>

## LANDSCAPE, PROSPECT AND VISUAL IDEOLOGY

While it is not suggested that perspective stands alone as the basis for realism and landscape painting



—the demand for *il vero* in Renaissance art was a complex social and cultural product<sup>54</sup>—it is argued that the realist illusion of space which was revolutionized more by perspective than any other technique was, through perspective, aligned to the physical appropriation of space as property, or territory. Surveyors' charts which located and measured individual estates, for example in England after the dissolution of monasteries; cartographers' maps which used the graticule to apportion global space, for example the line defined by Pope Alexander VI dividing the new world between Portugal and Spain; engineers' plans for fortresses and cannon trajectories to conquer or defend national territory, as for example Vauban's French work or Sorte's for the Venetian defences against Austria; all of these are examples of the application of geometry to the production of real property.<sup>55</sup> They presuppose a different concept of space ownership than the contingent concept of a feudal society where land is locked into a web of interdependent lordships based on fief and fealty. The new chorographies which decorated the walls of sixteenth-century council halls and signorial palaces,<sup>56</sup> and the new taste for accurate renderings of the external world which gradually moved from background to main subject matter, were both organized by perspective geometry and achieve aesthetically what maps, surveys and ordnance charts achieve practically. Landscape is thus a way of seeing, a composition and structuring of the world so that it may be appropriated by a detached, individual spectator to whom an illusion of order and control is offered through the composition of space according to the certainties of geometry. That illusion very frequently complemented a very real power and control over fields and farms on the part of patrons and owners of landscape paintings.<sup>57</sup> Landscape distances us from the world in critical ways, defining a particular relationship with nature and those who appear in nature, and offers us the illusion of a world in which we may participate subjectively by entering the picture frame along the perspectival axis. But this is an aesthetic entrance not an active engagement with a nature or space that has its own life. Implicit in the landscape idea is a visual ideology which was extended from painting to our relationship with the real world whose 'frame and compass' Elizabethans so admired and which Georgian English gentlemen would only approach through the language of landscape painting or the optical distortion of their Claude Glass.

The Italian word for perspective is *prospettiva*. It combines senses which in modern English are distinct: 'perspective' and 'prospect'. Perspective itself has a number of meanings in English, but as the projection of a spatial image onto a plane it first appears in the later decades of the sixteenth century. This usage is found for example in John Dee's Preface to the first English translation of *Euclid* (1570). Dee, the Elizabethan mathematician, navigational instrument maker and magician, links this use of perspective to painting in a classically renaissance way:

great skill of Geometrie, Arithmetik, Perspective and Anthropographie with many other particular arts hath the Zographer need of for his perfection... This mechanical Zographer (commonly called the Painter) is marvelous in his skil, and seemeth to have a divine power.<sup>58</sup>

Dee is writing at the opening of a decade which will see Saxton's county maps published and when a new 'image of the country' was being produced as an aspect of Elizabethan patriotism, using maps and landscape representations as instruments of Tudor power and nationalist ideology.<sup>59</sup>

By 1605 we can find reference to perspective as a form of insight, a point of view, as in the phrase 'getting something into perspective', or seeing it in its *true* light, its correct relationship with other things. Many of the early references quoted in the Oxford English Dictionary to support the definition of perspective as a drawing contrived to represent true space and distance relations refer to landscape and garden layout.<sup>60</sup> The visual ideology of perspective and of landscape as ways of seeing nature, indeed a true way of seeing, is certainly current in the English Renaissance. When we turn to the word *prospect* we find it used to denote a view outward, a looking forward in time as well as space. By the end of the sixteenth century prospect carried the sense of 'an extensive or *commanding* sight or view, a view of the landscape as affected by one's position'.<sup>61</sup> This neatly reflects a period when command over land was being established on new commercially-run estates by Tudor enclosers and the new landowners of measured monastic properties. That command was established with the help of the surveyors' 'malicious craft', the geometry which wrote new perspectives across real landscapes.<sup>62</sup>

By the mid-seventeenth century 'prospect' had become a substitute for landscape. The command that it implied was as much social and political as





FIGURE 6. Rousham garden, Oxfordshire. The Bowling Green: a Claudian landscape by William Kent

spatial. Commanding views are the theme of country house painting, poetry and landscaping throughout the seventeenth and eighteenth centuries (Fig 6), and a number of recent studies have revealed the degree to which landscape was a vehicle for social and moral debate during this period.<sup>63</sup> The prospects designed for men like the Duke of Marlborough at Blenheim who had made their fortunes from war had an appropriately military character in their blocks of woodland set against shaven lawns. This no doubt reinforced the image of power and authority, at least for those who wielded it. The survey skills which calculated and laid out these landscapes produced fortification plans, ordnance charts and campaign maps as well as serving the requirements of the parliamentary enclosers. It is not surprising that in his critique of emparkment and landscaping Oliver Goldsmith in *The Deserted Village* should describe the park that has replaced Sweet Auburn in military metaphors: 'its vistas strike, its palaces surprise'. In those great English landscape parks prospect also signified the future. Control was as much temporal as spatial. Their clumps of oak and beech would not be seen in full maturity by those who had them planted, but security of property ensured for later scions of the family tree the prospect on inheritance of command-

ing a fine view. The prospect of the eye was equally commercial, such woodland in the landscape was an economic investment. It represented prospecting in wood, as those who scoured the landscape in the following century seeking gold would be described.<sup>64</sup>

#### LANDSCAPE AND THE HUMANIST TRADITION IN GEOGRAPHY

Landscape comes into English language geography primarily from the German *landschaft*. Much has been written about the fact that the German word means area, without any particularly aesthetic or artistic, or even visual connotations.<sup>65</sup> My own knowledge of German usage is too meagre to contest this claim, but some comment is warranted. In Humboldt's *Kosmos*, regarded by many as one of the two pillars upon which German geography was erected, a whole section is devoted to the history of the love of landscape and nature up to the time of Goethe whom Humboldt greatly revered and who was a major visual theorist.<sup>66</sup> English geographers could have taken their landscape concept from John Ruskin and discovered a usage not very different from Humboldt's.<sup>67</sup> More directly, *Landschaft* in the work of Hettner and Passarge, the main sources for English language geographers like Carl Sauer and

R. E. Dickinson of the landscape concept, was confined to the study of *visible* forms, it was the eye which determined their selection and inclusion. Moreover, *Landschaft*, as Sauer's classic paper—'Morphology of Landscape'—makes clear,<sup>68</sup> was to be studied by the chorological method and its results transmitted descriptively in prose and above all by the map. Given what we know of the traditional links between cartography, chorography and landscape painting it is difficult to accept the argument that *Landschaft* sustained in German geography the entirely neutral sense of *area* or *region* as its English and American devotees of the inter-war period claimed. Certainly there is a thread of interest in German geography for *Gestaltende Geografie*, study of aesthetic holism in landscape, that runs from Humboldt through Ewald Banse to Gerhart Hard.<sup>69</sup>

Anglo-Saxon geographers introducing landscape as an areal concept were not unaware of the problems caused by its common usage as a painters' term. But in the interests of a scientific geography they were keen to distance their concept of landscape from that of painters or literary writers; poets and novelists. Thus the links between landscape, perspective and the control of space as property—the visual ideology common to landscape painting and cartography—have gone unrecorded and unexplored by geographers. This is particularly surprising today when we are far clearer about the role that geography has played in the evolution of the bourgeois concept of individual and national space.<sup>70</sup> Landscape remains part of our unexamined discourse, to be embraced by humanist geographers as a concept which appears to fulfil their desire for a contextual and anti-positivist geography. Whereas in the past landscape geographers actively distanced their concept from that of common usage, today writers like Samuels, Meinig, Wreford Watson and Pocock take the opposite position.<sup>71</sup> In both periods of its popularity in geography landscape as an artistic concept is given the role of potential or actual challenger to geographical science. Marwyn Mikesell's claim (with its interesting reference to perspective) is an example of this view:

the perspective of the geographer is not that of the individual observer located at a particular point on the ground. The geographer's work entails map interpretation as well as direct observation, and he makes no distinction between foreground and background. The landscape of the geographer is thus very different from that of the painter, poet or novelist. By means of sam-

pling, survey or detailed inventory, he achieves the comprehensive but synthetic perspective of the helicopter pilot or balloonist armed with maps, photographs and a pair of binoculars.<sup>72</sup>

The distinction seems spurious, it is drawn at the level of technique rather than aims and objectives. Given what we know of Leonardo's detailed notes on how light falls upon different rock formations, or of Constable's inventories of cloud formations and atmospheric conditions, of Turner's strapping himself to a ship's mast the better to observe the movement of the storm, or of Ruskin's instructions to painters to rival the geologist, botanist and meteorologist in their knowledge of topography, geology, vegetation and skies, it is likely that had they had access to the battery of techniques with which Mikesell would arm his geographer they would all have made good use of them. Certainly Christoforo Sorte would have revelled in their use to improve his 'chorographic art', and both Bruegel and Titian produced landscapes that have a perspective far above the ground and are as comprehensive and synthetic as Mikesell could wish for. Above all the geometry which underlay perspective, the constructional principle of landscapes, and which gave certainty to their realism, is the same geometry which determines the graticule of Mikesell's maps and delimits the boundaries or locates the elements of his geographical landscapes.

Beyond the issue of specific techniques there are also methodological similarities between landscape in painting and in geography, similarities which have allowed geographers to adopt unconsciously something of the visual ideology integral to the landscape idea. Like other area concepts in geography, *region* or *pays*, landscape has been closely associated in geography with the morphological method.<sup>73</sup> Morphology is the study of constituent forms, their isolation, analysis and recomposition into a synthetic whole. When applied to the visible forms of a delimited area of land this is termed *chorology*.<sup>74</sup> The result of a landscape chorology is a static pattern or picture whose internal relations and constituent forms are understood, but which lacks process or change. Indeed, one of the criticisms of chorology in the post-war years was precisely that it failed to explain the processes giving rise to the forms and spatial relations it described. The idea of change, or process, is very difficult to incorporate into landscape painting, although there are certain conventions like the *memento mori* or the ruined

building which occasionally do so. But one of the consistent purposes of landscape painting has been to present an image of order and proportioned control, to suppress evidence of tension and conflict between social groups and within human relations in the environment. This is true for the villa landscapes painted by Paolo Veronese in the strife-ridden Venetian countryside of the later sixteenth century, it was equally true for the arcadian image of English landscape parks in the Georgian period of rural conflict and transformation. In this sense the alignment of geographical landscape with morphology serves to reproduce a central dimension of the ideology of the landscape idea as it was developed in the arts.

Despite appearances the situation is little different in much of contemporary geographical use of landscape. Too often geographical humanists make the mistake of assuming that art and within it, landscape, are to do with the subjective, somehow standing against science and its proclaimed objective certainties.<sup>75</sup> The subjectivism of art is a recent and by no means fully accepted thesis, a product above all of the artistic self-image generated in the Romantic movement. Originally, as we have seen, landscape was composed and constructed by techniques which were considered to ensure the certainty of reproducing the real world. Equally, again as we have seen, there is an inherent conservatism in the landscape idea, in its celebration of property and of an unchanging status quo, in its suppression of tension between groups in the landscape. When we take over landscape into geography, and particularly into public policy we inevitably import in large measure the realist, visual values with which it has been loaded: its connections with a way of seeing, its distancing of subject and object and its conservatism in presenting an image of natural and social harmony. John Punter has pinpointed the place of these social and visual values in contemporary discussions of landscape and the conservation and planning of areas defined as having 'landscape value'.<sup>76</sup> A vast field awaits research into contemporary visual and social values in landscape<sup>77</sup>.

To return, however, to the opening point of this paper. Humanist geographers have spent a great deal of time and energy challenging the orthodoxy of positivism, they have opened up a debate on the language of geography—the constraints and opportunities of language. Some have even begun to explore the ideological assumptions inherent in our concepts of space itself.<sup>78</sup> All of these are important matters. But the ideology of vision, the way of see-

ing implicit in much of our geography still awaits detailed examination. At the most obvious level, we warn students of the pitfalls of accepting the authority of numbers, of the dangers of misused statistics, but virtually never those of accepting the cartographic, still less the landscape, image. Less obviously, but more significantly for geographical scholarship, geography and the arts, or geography as art, is frequently presented as a refuge from contentious social and political debates within the discipline, and the 'soul' of geography a resort in which we can express our 'passions' in the neutral and refined area of subjectivity and humane discourse, expressing ourselves in those reverential tones that serve purely to sustain mystification. Geography and the arts are too important for this. Both bear directly upon our world, both can challenge as well as support the ways we structure, modify and see that world.

In *Theoretical Geography* Bunge came closer than any other recent geographical writer to acknowledging the significance of the graphic image in geography. His later, brilliant use of cartography as a subversive art bears testimony to his insight.<sup>79</sup> Bunge was equally clear that geometry was the language of space, the guarantor of certainty in geographical science, visually and logically. As shown, the relationship between geometry, optics and the study of geographic space is very strong in European intellectual history since the Renaissance.<sup>80</sup> In Bunge's thesis spatial geometry was aligned to a powerful claim for geography as a generalizing positivist science, a very different conception of science from that understood by the founders of modern geometry and perspective, many of whom still recalled the magic of Pythagoras and regarded metaphysics as being as much a branch of science as empirical study,<sup>81</sup> and for whom the trivium and quadrivium were equal contributors to the seven liberal arts. In rejecting science *tout court*, humanist geographers have severed links with spatial geometry, concentrated on the material of the trivium and failed, among other things, to develop a proper critique of landscape.

Such a division was not true of Renaissance humanist geographers. John Dee was as close to Ortelius and Mercator as he was to Sir Philip Sidney, admired the magician Cornelius Agrippa's work as much as he did that of Copernicus. Cusanus' closest friend, the executor of his will, was Piero dal Pozzo Toscanelli. Toscanelli, from a Florentine merchant family, was a doctor, student of optics and the

foremost geographer of his day. As a member of the Greek Academy at Florence, he studied one of its greatest intellectual trophies, Ptolemy's *Cosmografia* brought from Constantinople in the early years of the fifteenth century. In this work Ptolemy describes a projection for the world map which uses the same geometrical construction as the Florentine humanists employed to develop linear perspective.<sup>82</sup> With the aid of this study Toscanelli produced a map which he sent with a letter to Christopher Columbus encouraging the Genoese navigator's exploration west on the grounds that the distance from Europe to China was shorter than was then commonly believed by cartographers. The geographical consequences of this collaboration of art, science and practical skill need not be spelled out here. But the example of this geographical colleague of the great humanists Alberti and Brunelleschi may remind contemporary humanists in geography to pay equal attention to the Albertian revolution as to that of Gutenberg.

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## NOTES

1. GEIPEL, R. (1978) 'The landscape indicators school in German geography', in LEY, D. and SAMUELS, M. (eds) *Humanistic geography: prospects and problems* (London) pp. 155–72
2. See for example the comments on landscape in HARVEY, D. (1969) *Explanation in geography* (London) pp. 114–15
3. SAMUELS, M. (1979) 'The biography of landscape', in MEINIG, D. (ed.) *The interpretation of ordinary landscapes* (Oxford) pp. 51–88
4. ROSE, C. (1981) 'William Dilthey's philosophy of historical understanding: a neglected heritage of contemporary humanistic geography', in STODDARD, D. R. (ed.) *Geography, ideology and social concern* (Oxford) pp. 99–133
5. RELPH, E. (1981) *Rational landscapes and humanistic geography* (London) p. 22. This sense of landscape as an all inclusive, quotidian phenomenon owes a great deal in North American geography to the work of J. B. Jackson. See for example the most recent collection of Jackson's landscape essays (1980), *The necessity for ruins and other topics* (Amherst)
6. See the discussion by PUNTER, J. V. (1982) 'Landscape aesthetics: a synthesis and critique', in GOLD, J. and BURGESS, J. (eds) *Valued environments* (London) pp. 100–23
7. PENNING-ROWSELL, E. C. (1974) 'Landscape evaluation for development plans', *J. R. Tn Plann. Inst.*, 60: 930–4
8. APPLETON, J. (1975) *The experience of landscape* (London)
9. POCOCK, D. C. D. (ed.) (1981) *Humanistic geography and literature: essays in the experience of place* (London); DANIELS, S. J. (1981) 'Landscaping for a manufacturer: Humphrey Repton's commission for Benjamin Gott at Armley in 1809–10', *J. hist. Geogr.*, 7: 379–96; COSGROVE, D. (ed.) (1982) 'Geography and the Humanities', *Loughborough Univ. of Techn., Occ. Pap.*, No. 5
10. This phrase is taken from BERGER, J. (1972) *Ways of seeing* (London), where some of the social implications of visual conventions are challengingly explored
11. Examples are numerous. One of the earliest is FRANCESCO FELICIANO (1518) *Libro d'aritmética, e geometria speculativa, e practica*, more commonly *Scala & Grimaldelli* (Venice). One of the most comprehensive was Cosimo Bartoli (1564) *Del modo di misurare le distantie* . . . (Venice)
12. MEINIG, D. (1983) 'Geography as Art' *Trans. Inst. Br. Geogr.* NS. 8: 314–28; WREFORD-WATSON, J. (1983) 'The soul of geography', *Trans. Inst. Br. Geogr.* NS. 8: 385–99; BILLINGE, M. (1983) 'The Mandarin dialect', *Trans. Inst. Br. Geogr.* NS. 8: 400–20. POCOCK, D. C. D. (1983) 'The paradox of humanistic geography', *Area*, 15: 355–58
13. As always, there are exceptions, although to my mind none have examined the visual in relation to geographical study as such: POCOCK, D. C. D. (1981) 'Sight and Knowledge', *Trans. Inst. Br. Geogr.* NS. 6: 385–93; TUAN, YI-FU (1979) 'The eye and the mind's eye', in MEINIG, *The interpretation of ordinary landscapes* (NOTE 3) pp. 89–102
14. BUNGE, W. (1966) *Theoretical geography* (2nd ed. Lund), p. xiv
15. YATES, F. A. (1964) *Giordano Bruno and the Hermetic Tradition* (London) pp. 160–1 discusses the relations of quadrivium and trivium in Renaissance humanism, arguing that 'the two traditions appeal to entirely different interests. The humanist's bent is in the direction of literature and history; he sets an immense value on rhetoric and good literary style. The bent of the other tradition is towards philosophy, theology, and also science (at the stage of magic)'. This argument depends on a very restricted definition of humanism (see her fn. 3, p. 160), ignores the visual arts which combined literary reference (ut pictura poesis) with 'scientific' skill, and fails to account for the large number of Renaissance scholars equally at



- home in philosophy and science as they were concerned with grammar, rhetoric and classical texts, for example Giangiorgio Trissino and Daniele Barbaro in sixteenth-century Venice
16. EISENSTEIN, E. L. (1979) *The printing press as an agent of change* (Cambridge)
  17. MARTINES, L. (1980) *Power and imagination: City-States in Renaissance Italy* (London)
  18. ALBERTI, L. B. (1966) *On painting* (trans. J. R. Spencer, London)
  19. Ibid pp. 47, 48
  20. Even photography was constricted by conventions of perspective realism, landscape painting having far more influence on early photography than vice-versa. See GALASSI, P. (1981) *Before photography: painting and the invention of photography* (New York)
  21. Ibid. pp. 16–17
  22. For a detailed discussion of Brunelleschi's experiment see EDGERTON, S. J. Jr. (1975) *The Renaissance rediscovery of linear perspective* (London) pp. 143–52
  23. REES, R. (1980) 'Historical links between geography and art', *Geogr. Rev.* 70: 66
  24. This group of paintings, produced before the centrally planned church became architecturally popular, includes Raphael's *Spozalizio* and Carpaccio's *Reception of the English Ambassadors* in the St Ursula cycle. The sacred significance of the circle and centre is an enormous topic with cross-cultural implications. See TUAN, YI-FU (1974) *Topophilia: a study of environmental perception attitudes and beliefs* (London)
  25. The distinction between mind, or intellect, and sense was central to much Renaissance thought, and is discussed in Yates, *Giordano Bruno* (note 15) p. 193. Geometry is of course an intellectual activity. Nicolo Tartaglia calls it 'the pure food of intellectual life' (il puro cibo della vita intellettuale) *Euclide Magarensis, philosopho* (Venezia, 1543) p. F11, in the first translation of Euclid into Italian. None the less, one of the reasons why humanists like Alberti accepted the significance of numbers and proportions was that the same proportions which pleased the intellect also seemed to please our eyes and ears. This is a cornerstone of Renaissance aesthetics
  26. BAXANDALL, M. (1972) *Painting and experience in fifteenth-century Italy* (London)
  27. FRA LUCA PACIOLI (1494) *Summa di arithmetica, geometria, proportione et proportionalità* (Venice). See the reference to the significance of this work in BRAUDEL, F. (1982) *Civilization and capitalism, 15th–18th Century. Vol. II: The Wheels of Commerce* (London) p. 573
  28. SILVIO BELLI (1565) *Libro del misurar con la vista...* (Venezia) preface, pp. 1–2 ('certamente è così meravigliosa il misurar con la vista, poi che ogni uno, che non sa la ragione par del tutto impossibile')
  29. ROSSI, F. (1877) *Groma e squadra, ovvero storia dell'agrimensura italiana dai tempi antichi al secolo XVII* (Torino)
  30. SCHULZ, J. (1978) 'Jacopo de 'Barbari's view of Venice: map making, city views, and moralized geography before the year 1500', *The Art Bull.*, LX: 425–74; MAZZI, G. (1980) 'La repubblica e uno strumento per il dominio', in PUPPI, L. (ed.) *Architettura e utopia nella Venezia del cinquecento* (Milano) pp. 59–62. It has been pointed out that, like contemporary ideal townscapes, the Barbari map lacks all human presence
  31. Renaissance writers never tire of emphasizing that geometry provides certainty. eg. Pacioli, *Summa di arithmetica...* (note 27) p. 2r 'e in la sua Metaphysica afferma (Euclid) le scientie mathematiche, essere nel primo grado de certezza'
  32. McLEAN, A. (1972) *Humanism and the rise of science in Tudor England* (London) pp. 112 ff. For a full discussion of Cusanus' work and its impact on Renaissance thought see CASSIRER, E. (1964) *The individual and the cosmos in Renaissance philosophy* (New York)
  33. IVINS, W. M. Jr (1946) *Art and geometry, a study of space intuitions* (New York) pp. 79–80
  34. There is no space here to explore the fascinating implications of Renaissance magic theories for attitudes to nature and natural beauty. These theories are of course fully discussed in Yates, *Giordano Bruno...* (note 15)
  36. There is no escaping the use of 'man' here. We are dealing with a specifically 'male' view of the world
  36. ALBERTI, L. B. (1965) *Ten books on architecture* (trans. of J. Leoni, 1755; facs. copy, London) p. 194
  37. SARTORI, P. L. (1981) 'Gli scrittori Veneti d'agrarìa del cinquecento e del primo seicento. Tra realtà e utopia' in Tagliaferri, E. (ed.) *Venezia e la terraferma attraverso le relazioni dei rettori* (Milano) pp. 261–310. See particularly the last three 'days' of GALLO, A. (1565) *Le dieci giornate della vera agricoltura e piacere della villa* (Vinegia)
  38. ZORZI, L. (1977) *Il teatro e la città. Saggia sulla scena italiana* (Torino). On the links between theatre and cosmological theories see YATES, F. A. (1966) *The art of memory* (London)
  39. GOMBRICH, E. (1971) 'The renaissance theory of art and the rise of landscape', in Gombrich, E. *Norm and Form: studies in the art of the renaissance* (London) 109
  40. CLARK, K. (1956) *Landscape into art* (Harmondsworth)
  41. Significantly, the title of the essay by JACKSON, J. B. (1979) 'Landscape as theatre' in *Landscape*, 23: 3; and reprinted in JACKSON, *The necessity for ruins* (note 5)
  42. BLUNT, A. (1962) *Artistic theory in Italy 1450–1600* (Oxford) p. 26 Italics added
  43. Quoted in Ibid. p. 50

44. Leonardo was a master not merely of linear perspective but also of that other and distinct form of perspective, *aerial perspective*, which plays a complementary role in creating the illusion of space through the manipulation of tone, light and shade and colour intensity. While based on optical theory and experiment, aerial perspective is not geometrically founded. Leonardo's work with colour and chiaroscuro allowed him to convey the 'mood' of space, and he saw the superiority of painting over other arts to lie in its ability to employ aerial perspective
45. ALEXANDER, D. 'Leonardo da Vinci and fluvial geomorphology', *Am. J. Sci.* 282: 735–55
46. SCHULZ, J. (1976) 'New maps and landscape drawings by Christoforo Sorte', *Mitteilungen der Kunsthistorischen Institutes in Florenz* XX: 1; MAZZI, G. (1980), 'La Repubblica e uno strumento per il dominio' in PUPPI, L. (ed.) *Architettura e Utopia nella Venezia del Cinquecento* (Milano) pp. 59–62
47. SORTE, C. (1580) 'Osservazioni nella pittura', reprinted in BARROCCHI, P. (ed.) (1960) *Trattati d'arte del cinquecento: fra manierismo e controriforma* Vol. 1 (Bari) pp. 275–301. This text merits detailed geographical study, not only as a discussion of landscape and cartography but equally because Sorte appears to anticipate by a century the recognition by John Ray of the real movement of the hydrological cycle
48. Letter from Vitali to Sorte, reprinted in Barocchi, *Trattati d'art* ... (note 47) p. 275
49. SORTE, 'Osservazioni nella pittura' (note 47) p. 282: 'Inoltre ho posta detta Corografia con le sue giuste misure e distanze in pianta'. In other words, the work was based on a planispheric survey. On the relations between such survey and perspective see Edgerton. *The Renaissance rediscovery* (note 22)
50. SORTE, 'Osservazioni nella pittura' (note 47) p. 283
51. BERENSON, B. (1952) *Italian painters of the Renaissance* (London) p. 12
52. Quoted in WILTON, A. (1980) *Turner and the sublime* (London) p. 70
53. IVINS, *Art and geometry* (note 33) pp. 105–10; GALASSI, *Before Photography* (note 20)
54. MARTINES, *Power and imagination* (note 17); BAX-ANDALL, *Painting and experience* (note 26)
55. A point that has not gone entirely unnoticed by historical geographers. See for example Ian Adams' work on the role of land surveyors in eighteenth-century Scottish agrarian change. ADAMS, I. H. (1980) 'The agents of agrarian change', in PARRY, M. L. and SLATER, T. R. (eds) *The making of the Scottish countryside* (London) pp. 155–75, esp. pp. 167–70
56. For example the great gallery of maps painted by Ignazio Dante in the Vatican (1580–83) or the similar commissions to Christoforo Sorte to paint walls in the Ducal Palace at Venice (1578 and 1586)
57. COSGROVE, D. (1982) 'Agrarian change, villa building and landscape: the Godi estates in Vicenza 1500–1600', in Ferro, G. (ed.) *Symposium on historical changes in spatial organisation and its experience in the Mediterranean world* (Genova) pp. 133–56; DANIELS, D. J. (1982) 'Humphrey Repton and the morality of landscape', in GOLD, J. and BURGESS, J. (eds) *Valued environments* (note 6) pp. 124–44
58. Quoted in McLEAN, *Humanism and the rise of science* ... (note 32) p. 138. The translation of *Euclid* was by Billingsley. For Dee's importance for geography and cartography see TAYLOR, E. G. R. (1954) *The mathematical practitioners of Tudor and Stuart England* (London) pp. 26–48. For Dee and magic see YATES, *Girodano Bruno* (note 15) pp. 148–50
59. MORGAN, V. (1979) 'The cartographic image of the country in early modern England', *Trans. R. Hist. Soc.* 29: 129–54
60. The whole issue of garden design along circular and orthogonal lines is too large to discuss here but is obviously very closely related to the geometry under discussion, to spatial theory and those of microcosm, macrocosm and medicinal concepts. The first such garden was designed in Padua in the late sixteenth century by Daniele Barbaro, translator of Vitruvius and commentator on *Euclid*. See JACKSON, J. B. (1980) 'Nearer than Eden' and 'Gardens to Decipher' in *The necessity for ruins* (note 5) pp. 19–35 and 37–53
61. OXFORD ENGLISH DICTIONARY (OED), italics added
62. THOMPSON, F. M. L. (1968) *Chartered surveyors: the growth of a profession* (London); HARVEY, P. D. A. (1980) *The history of topographic maps: symbols, pictures and surveys* (London). The idea that surveying was a malicious and magical art was founded in part on the negative consequences for traditional land rights of new concepts of private property enshrined in the legal document that the surveyor produced, in part on the recognition of connections between the geometry of survey techniques and that of hermetic magicians. In the book burnings under Edward VI books containing geometrical figures were particularly at risk
63. TURNER, J. (1979) *The politics of landscape: rural scenery and society in English poetry 1630–1690* (Oxford); ADAMS, J. (1979) *The artist and the country house. A history of country house and garden view painting in Britain 1540–1870* (London); BARRELL, J. (1980) *The dark side of the landscape: the rural poor in English painting 1631–1741* (Cambridge); ROSENTHAL, M. (1982) *British landscape painting* (London)
64. The OED notes that the verb 'to prospect' emerged in the nineteenth century referring to the particularly capitalist activities of speculative gold mining and playing the stock exchange. It is interesting to note how 'speculation' has itself roots in visual terminology

65. MIKESELL, M. (1968) 'Landscape', in *International encyclopaedia of the social sciences* (New York) p. 577–79. DICKINSON, R. E. (1939) 'Landscape and Society', *Scott. geogr. Mag.* 55: 1–15; HARTSHORNE, R. (1939) *The nature of geography. A survey of current thought in the light of the past* (Lancaster, Pa.)
66. HUMBOLDT, A. VON (1849–52) *Cosmos: a sketch of a physical description of the Universe* (London), Vol. II. The relationship between the landscape idea and attitudes to nature in the nineteenth century is of course enormously complex. On Goethe and geography see SEAMON, D. (1978) 'Goethe's approach to the natural world: implications for environmental theory and education', in LEY and SAMUELS, *Humanistic Geography* (note 1) pp. 238–50
67. COSGROVE, D. (1979) 'John Ruskin and the geographical imagination' *Geog. Rev.* 69: 43–62
68. SAUER, C. O. (1926) 'The morphology of landscape', reprinted in LEIGHLY, J. (ed.) (1963) *Land and life: selections from the writings of Carl Ortwin Sauer* (Berkeley and Los Angeles)
69. BANSE, E. (1924) *Die Seele der Geographie* (Brunswick); HARD, G. (1965) 'Arkadien in Deutschland', *Die Erde*, 96: 31–4
70. HARVEY, D. (1974) 'What kind of geography for what kind of public policy', *Trans. Inst. Br. Geogr.*; HARVEY, D. (1984) 'On the history and present condition of geography: an historical materialist manifesto', *Prof. Geogr.* 35: 1–10
71. Notes 3 and 12
72. MIKESELL, 'Landscape' (note 64) p. 578
73. Explicitly so by SAUER, 'Morphology of Landscape' (note 67), and equally in physical geography where landscape in the title suggests a morphological study of landforms
74. VAN PAASEN, C. (1957) *The classical tradition of geography* (Groningen)
75. See for example the diagram which serves as the foundation for the discussion of spatial concepts in SACK, R. D. (1980) *Conceptions of space in social thought: a geographical perspective* (Minneapolis) p. 25
76. PUNTER, J. 'Landscape aesthetics ...' (note 6)
77. Some of the essays in GOLD, and BURGESS, *Valued environments* (note 6) begin to broach this field, as have papers presented in recent IBG sessions of 'Geography and the Media'
78. SACK, *Conceptions of Space ...* (note 74)
79. BUNGE, W. (1973) 'The geography of human survival', *Ann. Ass. Am. Geogr.* 63: 275–95
80. This is distinct from the relations of Greek geometry which apparently were derived from a tactile-muscular apprehension of space, an apprehension which was non-visual. IVINS, *Art and geometry* (note 33)
81. YATES, *Giordano Bruno* (note 15) pp. 144–56
82. EDGERTON, *The Renaissance rediscovery ...* (note 22)