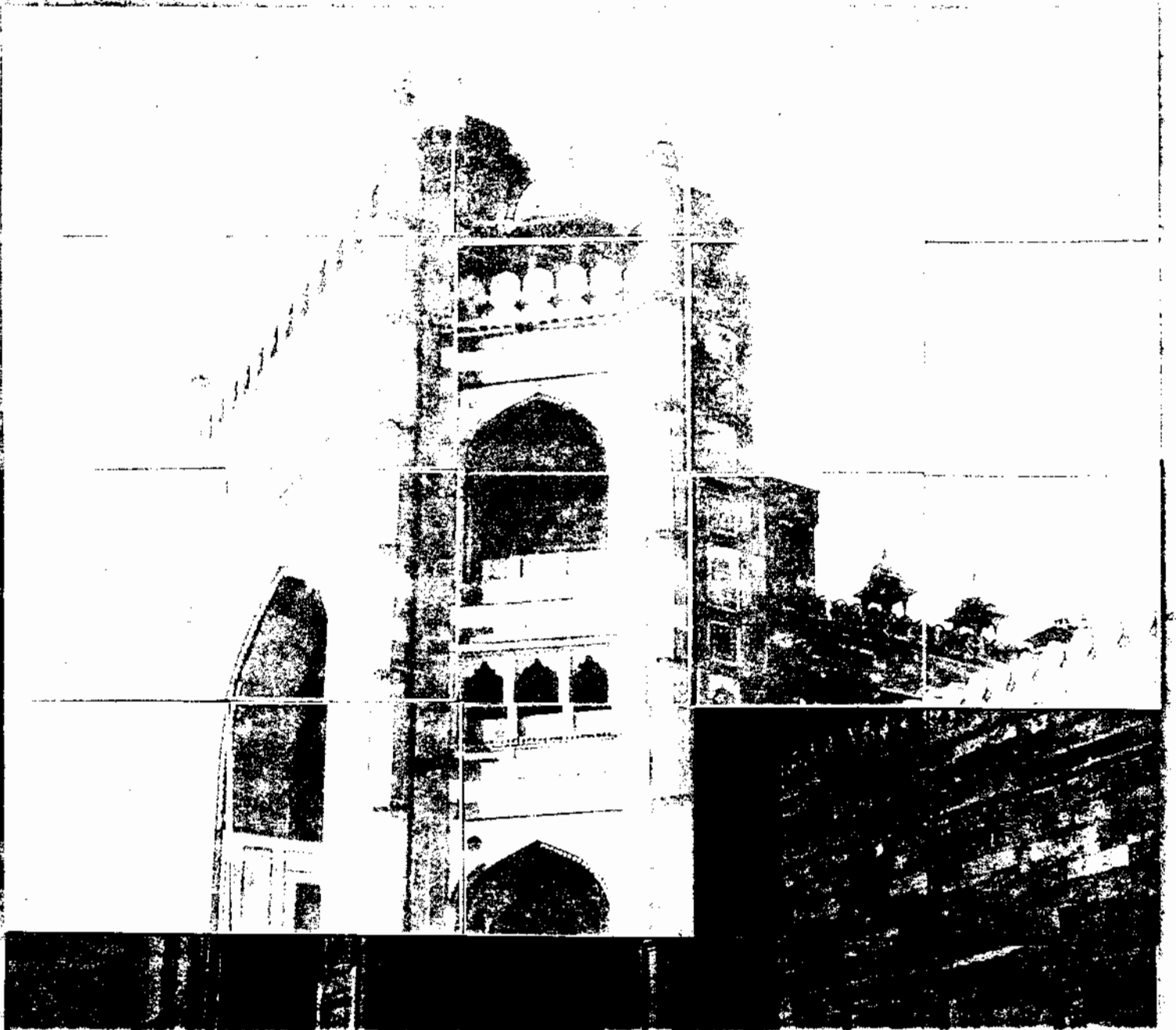


3

The Geometry of Power: The City's Planning

Attilio Petruccioli



The character and development of Fatehpur-Sikri's urban layout must be considered in the broader framework of Mughal administrative reform.¹ The need to reorganize fiscal revenues and to put some order into the expanding empire would have had its parallel in the reorganization of productive activities—agriculture and, to a lesser extent, crafts and trade—and in the consumption, mainly by the court, of the goods thus generated. The far-reaching administrative division of the empire was reflected in a territorial division which by the time of Shah Jahan clearly indicated what the original intentions were. Settlements were distributed according to a three-tiered plan. The first tier comprised villages of pre-Islamic origin, spaced on an average of every three kilometers; these formed the productive base for the empire. The second tier comprised the intermediate towns whose function was consuming and trading in agricultural produce. These were spaced every twenty-five to thirty kilometers, and determined where new foundations, aimed at filling all the gaps in this ideal network, would be located. The third and top tier was represented by the capital at the very center of this system, a place designated for the grandiose consumption of the king.

This pyramidal and apparently rigid system was in reality very flexible because it could be expanded in all four directions like a checkerboard. Nor did it inhibit the mobility of the Mughal emperors. In fact, moving at will over the checkerboard, they could declare any place to be the capital simply by raising the imperial banner. The site chosen for a capital did not always respond to the criteria of administrative organization; it could be and often was determined by foreign-policy requirements. Hence it is no surprise that at the death of Akbar in 1605, Uttar-Pradesh already had a regular pattern of human settlements (any exceptions could be explained by the terrain) to which Christaller's method² could be applied. An important corollary was that Fatehpur-Sikri was not an isolated phenomenon that owed its existence to a sovereign's whim, but was one of many analogous foundations—albeit the most outstanding from an architectural standpoint—of Akbar's reign. Suffice it to mention such ancient centers as Hardwar, Benares, Mathura, and Ayodhya, and the foundation by Akbar or his governors of Itmadpur and Firozabad in the Agra district, Farrah in the Mathura district, Jalalabad and Faridnagar in the Meerut district, Jalalabad and Tilhar in the Shahjahanpur district, Akbarpur and Jalalpur in the Fayzabad district, Kishanpur in the Fatehpur district, and Mughal Sarai on the imperial highway.³ Last but not least there is the port city of Allahabad, to the west of Prayag, founded in 1572 to strengthen the strategically important area at the confluence of the Ganges and the Yamuna. Within this regional system, with a bias toward Rajasthan for military reasons, appears the built-up area of the capital Agra—Fatehpur-Sikri (fig. 3.1).

The upgrading of the state road network as a support for trade also represented a symbolic measurement of the territory; the *kos minars* measure the continuous network, established in a theoretically uniform manner throughout the empire starting from the center. The series of buildings, such as

caravanserais, of bridges, wells, avenues (the state roads, like that between Delhi and Agra, bordered with plane trees), and post stations that accompanied this grandiose project are exceptional monuments placed here and there by Muslim piety, but are in keeping with the global vision of bringing order into the landscape as well.⁴

The Mughal sovereigns believed that the geometrical harmony of their territory, towns, and architecture was the best testimony to their power. Two examples stemming from the two basic requisites of the hierarchic city can be cited. One is the use of the center as the point of spatial and temporal convergence of all activities; the other is the boundary, which with its centripetal force, counters the disintegrating effect of urban growth. Glenn D. Lowry⁵ shows how Humayun's tomb in Delhi, by its gigantic scale and its orientation, becomes a point of reference for the construction of the city. I would add that the new modules of the garden, each of 100 *ilahi g* form the nucleus for a large-scale urban grid. It matters little at this point if it is only of symbolic value.

The great Buland Darwaza of the Jami' Masjid [17] at Fatehpur-Sikri, a gigantic iwan resembling an upturned globe, gazes southward toward the lands of Malwa and Gujarat in unison with the city's outer wall. Once these lands were brought under Mughal domination, it became the great iwan of an immense imaginary enclosure, presupposing the hypothetical presence of three other iwans.

This is not the place to relate the history of the Islamic garden in India, but its evolution can be read as a transition from closed to open space, from static to dynamic, and from indifference to the landscape to total immersion in it. The transition took place through a change in the use and significance of the original centripetal symmetry of the *chahar bagh*, regarded as a *unicum* and *monumentum*. First it was enlarged by the multiplication of the original module through the addition of equal, not hierarchically graded, modules. Only later do organizing instruments, such as axes, junctions (defined architecturally from time to time by a pavilion or *chabutara*, a cascade, a pool of still water, or service building such as caravanserais), and so on introduce a composition on a greater scale.

In the second half of the sixteenth century, the garden becomes the field of experimentation where the techniques of urban design are refined: axes and "scenography," on the one hand; grids and proportions, on the other. Something similar occurs in France under Louis XIV. It reflects a desire to construct a monument that will unite cultures very distant from each other: the Isfahan of Shah Abbas with the Mekka of Moulay Ismail with the Roi Soleil's Versailles, for example.⁶ An important document, the *Naksha-i a'man* (The disposition of the Mughal camp), helps us understand the disposition of the buildings and the various functions carried out in the Mughal palaces. The court was often on the move, and wherever the sovereign went he was accompanied by officials of the various ministries, princesses, nobles, the imperial guard, and bureaucracy. This is the basis of the very detailed description left by Abu'l F

we know that in the Mughal camp the central part was taken up by a sequence of courtyards progressing in hierarchical order from the public to the private up to the most private, the imperial harem. A belt on three sides was occupied by the princes, and a further external belt was used for storage tents and other services. At the front of the shorter side was the bazaar. Whatever the topography of the land, the Mughals tended to reproduce the same scheme in their permanent settlements to make a veritable stone encampment.⁷

This remark sheds considerable light on why the urban plan of Fatehpur-Sikri is the way it is, if one allows for the indissoluble interweaving of the Mughal mania for symbols of power and for rationalizing the environment with geometry. But anyone expecting to find in this short text an answer to questions that have been unanswered for centuries, such as the hypothetical existence of a Rajput city, or a precise chronology of the successive city plans, will be disappointed. To be sure, from the standpoint of topology such a significant site could not have been overlooked by a military caste; its defensive advantages are obvious. The ridge occupied by Fatehpur-Sikri extends for kilometers toward Rajasthan. It is thus possible that what is so eagerly sought underneath is simply further along the side. But such questions fall within the sphere of archaeology, and so far archaeological investigation has been very piecemeal. The entire archaeological structure has to be thoroughly photographed from the air with infra-red film, excavations—even partial ones—of the interstitial areas have to be undertaken, and comparative studies of stylistic features, masonry techniques, and decoration have to be completed.

The following observations are based on work carried out, with interruptions, over a fifteen-year period, which involved the architectural surveying of all the structures above ground and a number of preliminary analyses of the masonry superimpositions.⁸ From these investigations it became obvious that an understanding of this singular settlement must proceed via two nodal areas that have so far been neglected by scholars: the complex of buildings and ruins concentrated east of the Divan-i 'Amm [66], of which the mint [82], forms a part, and the zone situated at the foot of the Hatyapul or Elephant Gate [22].

In the first, there is an area in the shape of a scalene triangle, bounded by the wall of the Divan-i 'Amm, the wall of the mint, and on the third side the treasury [73]. It is a much-worked-over area that underwent various transformations and a good deal of demolition in E. W. Smith's time. What remains are, to the north of the Divan-i 'Amm, a number of structures in a very poor state of preservation, including some interesting branched pillars, and a row of buildings, in line with the first one, with the mint inserted as a forbidding mass. Deduction tells us that the mint is a later building, and the architectural survey tells us that it is in fact two similar buildings joined together. In the inner courtyard the foundation walls not in line with any of the earlier

structures. One hypothesis is that these remains were demolished by Akbar for the construction of his buildings—the tall branched pillars are typical of stables—which were demolished in their turn when the mint was constructed, perhaps during a visit by Jahangir or Shah Jahan. If this were the case, the hypothesis that it functioned as *karkhanas* (workshops) no longer holds true, and the hypothesis that it provided shelter for pack animals gains credence.⁹

From the tip of the triangle opposite the Divan-i 'Amm begins a linear bazaar [75 and 77], with a row of workshops on either side, which must have stretched as far as the Agra Gate [4]. It is interrupted one-third of the way down by the Chahar Suq [76], a quadrangular building which at the time must have provided access to two residential districts for nobles, although there is no longer any evidence of this. The sources¹⁰ and the construction techniques relate the Chahar Suq with the Divan-i 'Amm. The third side is partly occupied by the regular quadrilateral form of the treasury, whose lack of one smaller side gives it the appearance of a loggia opening onto the street, and by a low, domed building of absolutely no architectural value, but of great interest.

The third spatial module is intersected at an angle of about forty-five degrees in the direction of the Divan-i 'Amm. The interior of this module seems to be rammed by the wall of the first one. It is therefore certain that before Akbar's time this area of the hill was covered from one side to the other by a continuous pattern of structures, and that he placed there a palace planned with a different orientation—that of the Jami' Masjid—carrying out the requisite demolition, but retaining as much as possible of the pre-existing structures. The small building mentioned above belongs, judging by its position, its materials, and its construction techniques to a large architectural complex covering the whole southern side of the ridge. Here it is possible to "read" another example of an enforced inclusion of new building structures, in this case that of the royal baths [69-71]. This is the most monumental complex in Fatehpur-Sikri of its kind, and it presents a rotation of some degrees with respect to the pre-existing palace complex. In order to cover over the suture and to integrate the whole into a single organism, a portal with two spans was superimposed.

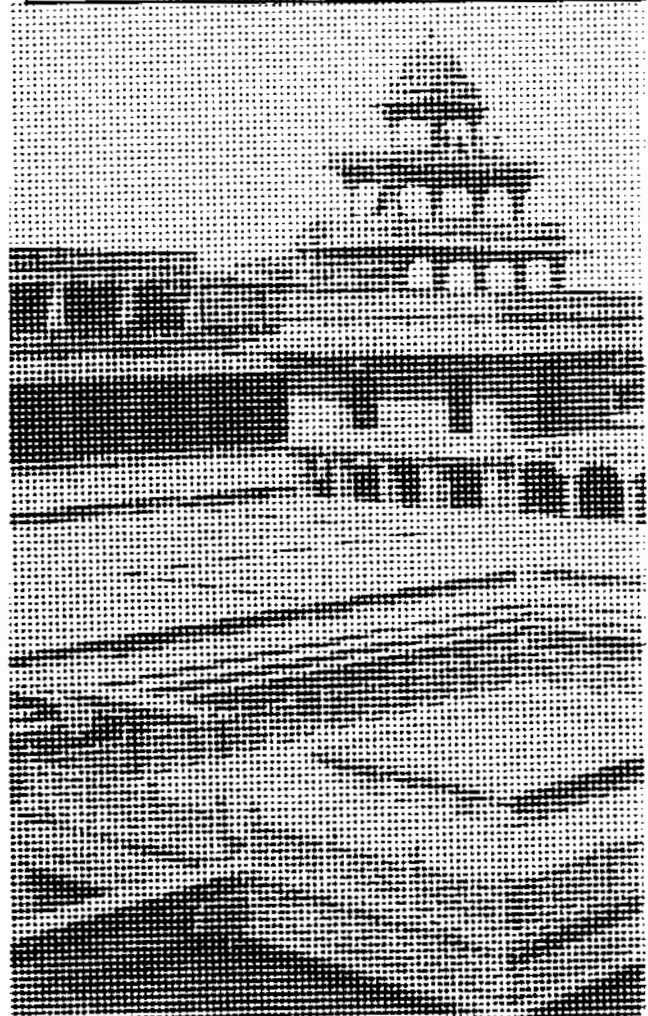
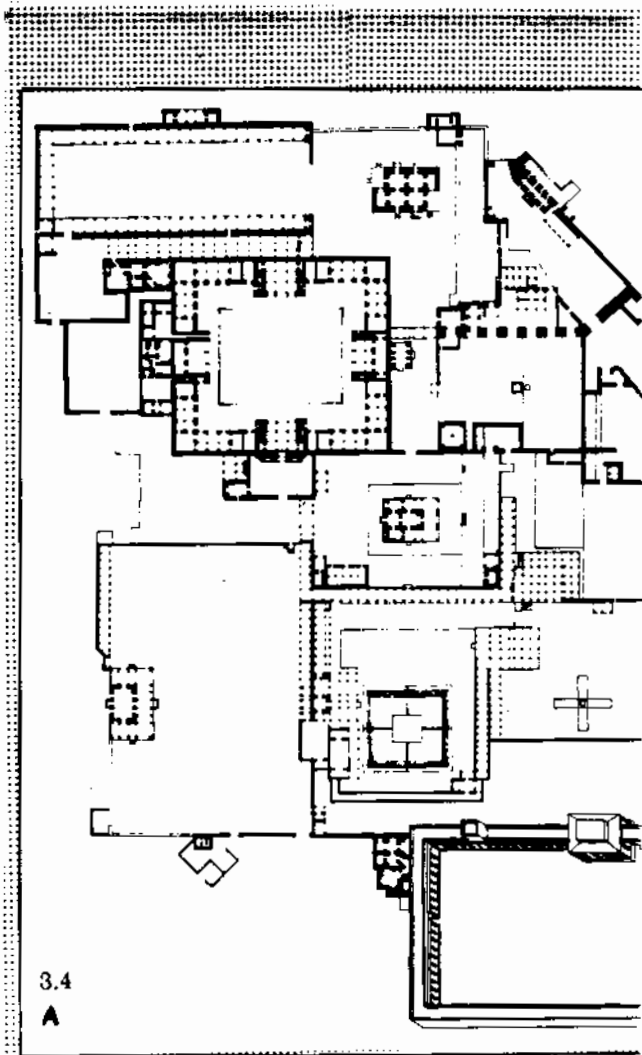
The second zone, too, presents some interesting aspects. Its ensemble of buildings were coordinated around an axis perpendicular to the Hatyapul (fig. 3.2). They either sit on the plain, are set against the rocky side of the ridge, or are freely composed around the gate. Starting at the bottom is the curious form of the Hiran Minar [100], very probably a sort of *akhas diya* (symbolic lamp) of stone, although it cannot be ruled out that it filled the role of starting point (zero milestone) of the road system (fig. 3.3). Immediately behind, connected with an overpass, is the great caravanserai [103], a structure in a reasonable state of preservation, which ingeniously takes advantage of the contours of the terrain. In Akbar's time it did not stand in isolation, as it does today, but formed part of a strip of courtyards and gardens arranged

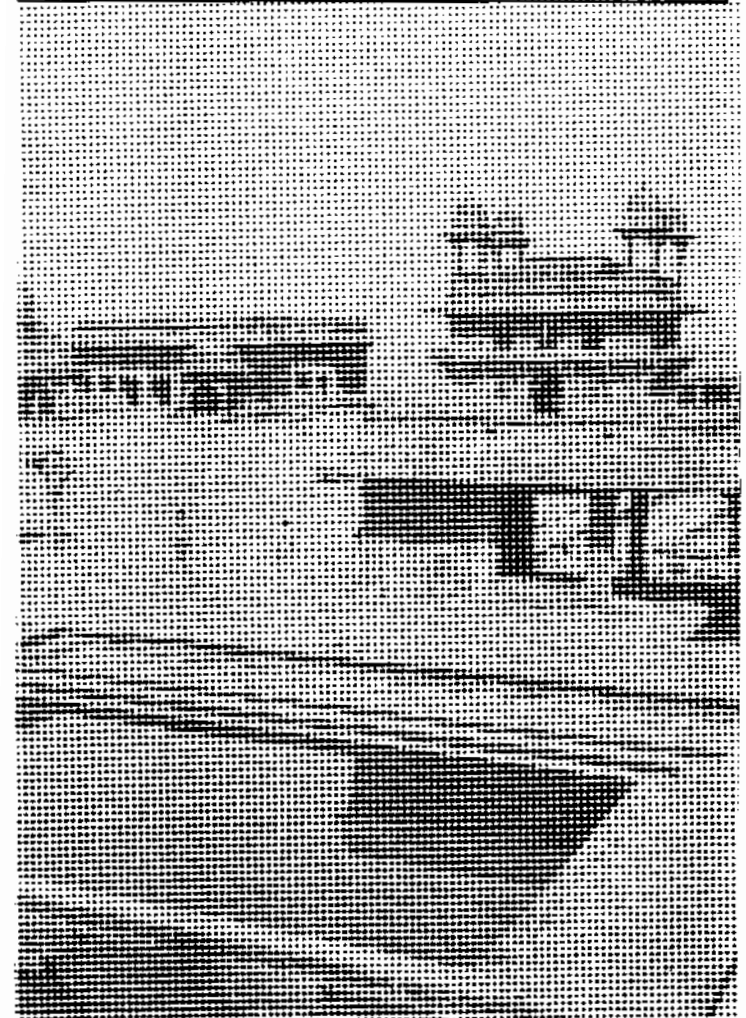
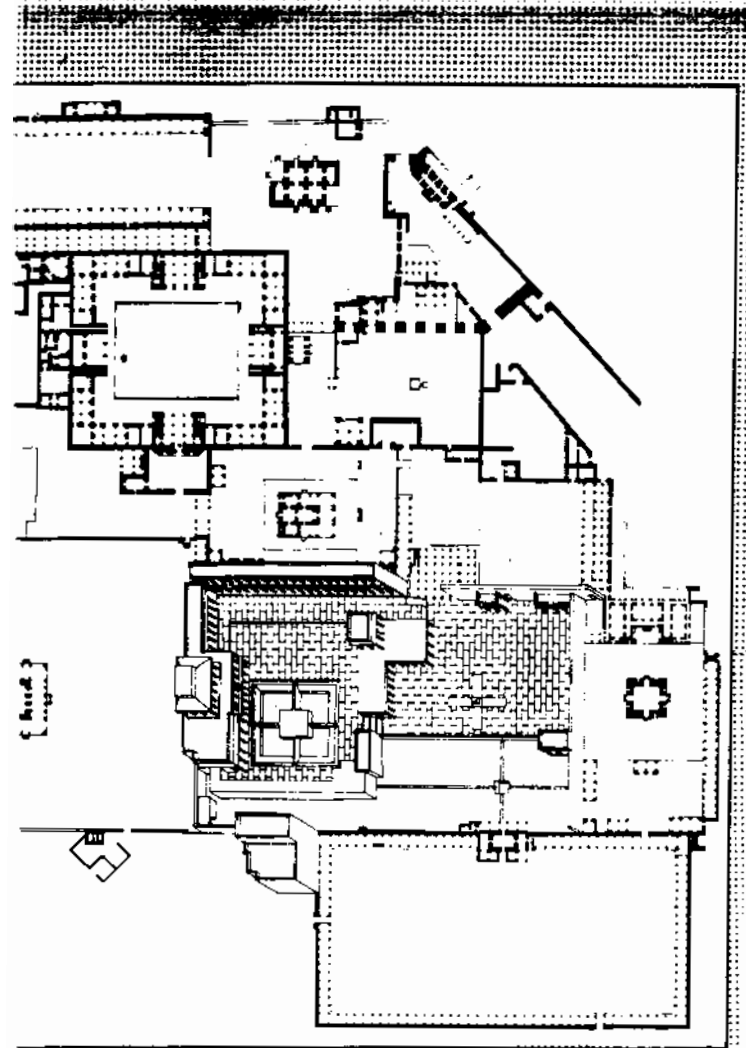
parallel to the side of the ridge [104 and 105]. These complexes were probably utilitarian structures, similar to the caravanserai, used to house the imperial guard, as stables, for an arsenal, and so forth. Only the side against the hill now remains.

The ingenious system of raising water, already described by E. W. Smith,¹¹ presents an accentuated rotation of twelve degrees with respect to the caravanserai. The different architectural quality of its two components suggests that it was built in two periods. The majority of the utilitarian structures in this zone probably date from Babur's time, and Akbar just carried out the more monumental addition of the front of the Hatyapul and the Saman Burj [23]. A last and very interesting clue is found around the Ajmer Gate [9]. Extensive ruins of pavilions along the lakeshore on both sides of the town walls and the presence of the two graceful octagonal pavilions [109 and 110] suggest the leisure function of the whole area. If the Lodi dynasty's passion for this planimetric form were not enough, it would suffice to look at how the smaller of the two pavilions [109] is connected to the end of the wall for it to become apparent that all these buildings originally formed part of a single fabric that was later divided into two by Akbar.¹² All the examples cited show signs of anything but elegant design; they appear to have been built in haste and for the sole purpose of integrating structures that already existed.

The complex of courtyards and pavilions of the palace proper, although it displays the unity of taste and style of Akbar's time, reveals certain incongruencies of design and construction (figs. 3.4, 3.5). A number of minor additions to the Khwabgah [54], the Turkish Sultana's House [57], and the Panch Mahal [36] do not influence the overall composition of the palace.¹³ But the building that is the key to the understanding of the constructive phases of the whole palace complex, Jodh Bai's Palace [50], is more revealing. It is a stark, introverted building, more like a ribat than like any of the surrounding courtyards. It displays no internal alterations. Next to it is the monumental bridge [43], marked by the rhythm of its *chhatris*, which moving northward from Jodh Bai's Palace, establishes a composition of volumes with the garden below [40] that astounds us by its modernity. Originally the garden was closed on that side by a series of small buildings dominated by the little oratory called the Nagina Masjid [30]. The masonry mass of the bridge forcefully enters the garden and breaks both the visual and the functional continuity between it and the oratory. It is assuredly a later addition, confirmed by the casual way it is joined to the palace all too far behind the graceful Hawa Mahal [42].¹⁴ We know for certain that a similar overpass—demolished by Smith—connected the palace with the Khwabgah.

A number of conclusions can be drawn from all these observations. First of all, the romantic hypothesis that the new capital was founded at the sovereign's whim for the purpose of establishing his residence in contact with the saintly hermit Shaikh Salim ad-Din Chishti must be shelved. Fatehpur-Sikri was a political operation implemented to





achieve two very precise aims. The town was conceived as a seat for the court through an operation analogous to that a century later when Louis XIV established his court at Versailles, centralizing the court in order to keep the nobility firmly under control. It is perfectly possible that Akbar set about controlling the various tribes (Rajputs, Turks, Afghans, and Persians), who were continually at war with each other, by the simple expedient of uprooting them either from their territories or from an economic center such as Agra. That Fatehpur-Sikri is a residential city, a "gilded prison" for the court, and not a redundant Agra, is demonstrated by the insufficiency of its military defenses.

The hypothesis that the whole city was constructed at once is also untenable. The sovereign's fervor for construction, the availability of manpower, the abundance of quarries in the environs, and the ingenious system of prefabrication with a dry-method assembly of elements are not enough to postulate the construction of such an extensive city over a period of just fifteen years.¹⁵ In addition, Akbar's constructions show evidence that his measures were carried out on an already existing city. Limiting ourselves to just the three areas already described, it is evident that the southern slope of the ridge was intensively covered by noble residences and that on the northern slope utilitarian and military structures prevailed, while the Ajmer Gate area was a leisure quarter.

The styles and construction techniques vary considerably between the buildings of the palace and those lying along the scarp of the ridge. Among the first the dry-assembly method of construction prevails, with monolithic architraved systems, as against the use of rubble masonry and vaults or mixed structures in the second. The palace has a phantasmagoric variety of spaces, but it still manages to maintain a unified appearance if one excepts Jodh Bai's Palace. The two bridges only reaffirm the compositional centrality of this building. Whether it was pre-existing or not, or even of Rajput origin, does not cancel out the fact that the whole layout of the palace stems from this massive quadrangle.

The functions to be attributed to the individual buildings remain open questions. If the whole complex is re-examined using the analogy of the Mughal encampment, then in the Hatyapul area we have the *akhas diya*, the caravanserai, and analogous structures comparable to the arsenal and to warehouses. That a retail bazaar might have been situated along the road below can also not be excluded. We know for certain that the *naqqarakhana* was located in the Saman Burj alongside the gate.¹⁶ But the Divan-i 'Amm [66], rather than being immediately inside the gate, was quite a distance away to the east. On the opposite side, alongside the mint is a linear bazaar and the Chahar Suq, with which the function of *naqqarakhana* could easily have been associated. In 1639 an analogous quadrangle was built as the terminal part of the urban bazaars of Shah Jahan in the huge Red Fort in Delhi.¹⁷ If the traditional functions of the Divan-i Khass, of the private residence in the Khwabgah, and of the harem in Jodh Bai's Palace were to be confirmed, they would perfectly reflect the

sequence of the encampment. Now, however, this very strong axis ends at a secondary entrance. While we can imagine a series of courtyards between the bazaar and the palace of the *darbar*, some doubt remains because I strongly suspect that the two secondary openings in the Divan-i 'Amm were made by the British in the first half of the nineteenth century.¹⁸

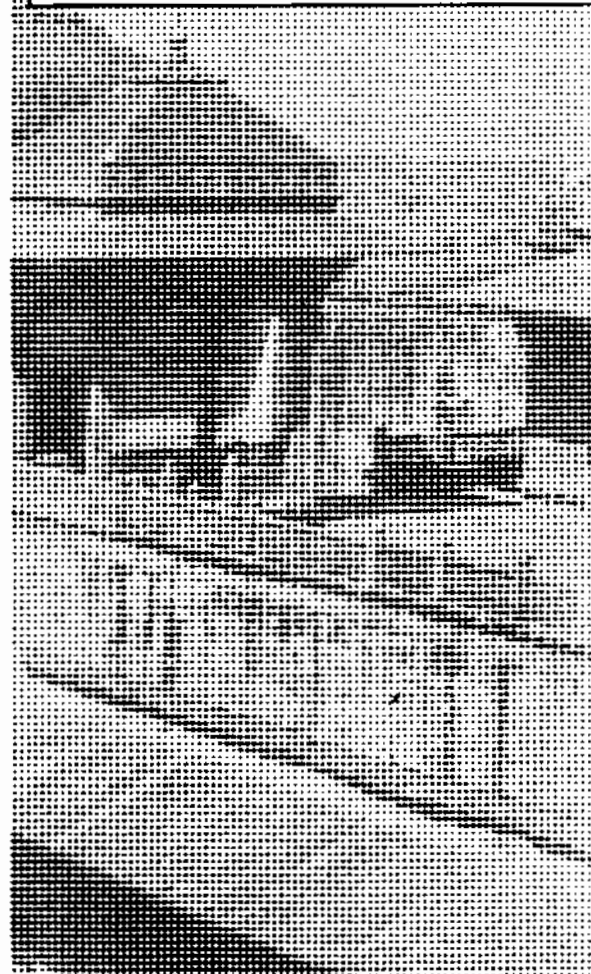
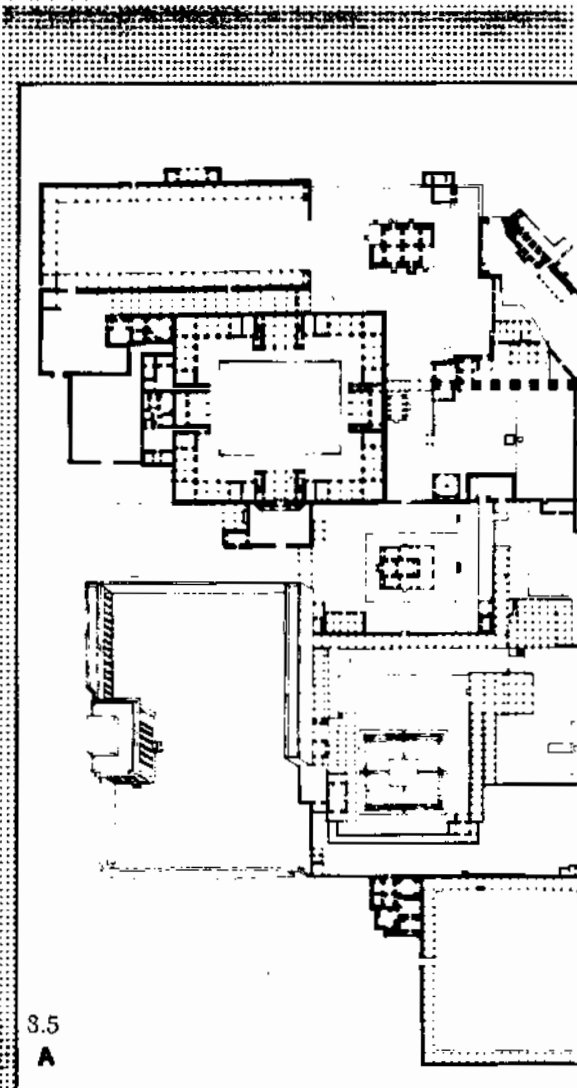
Although the hypothesis—that Akbar's changes of mind had in the course of construction turned what was intended to be a residence into a capital of the empire—cannot be excluded, two other hypotheses—one diachronic, one synchronic—have at least to be entertained.

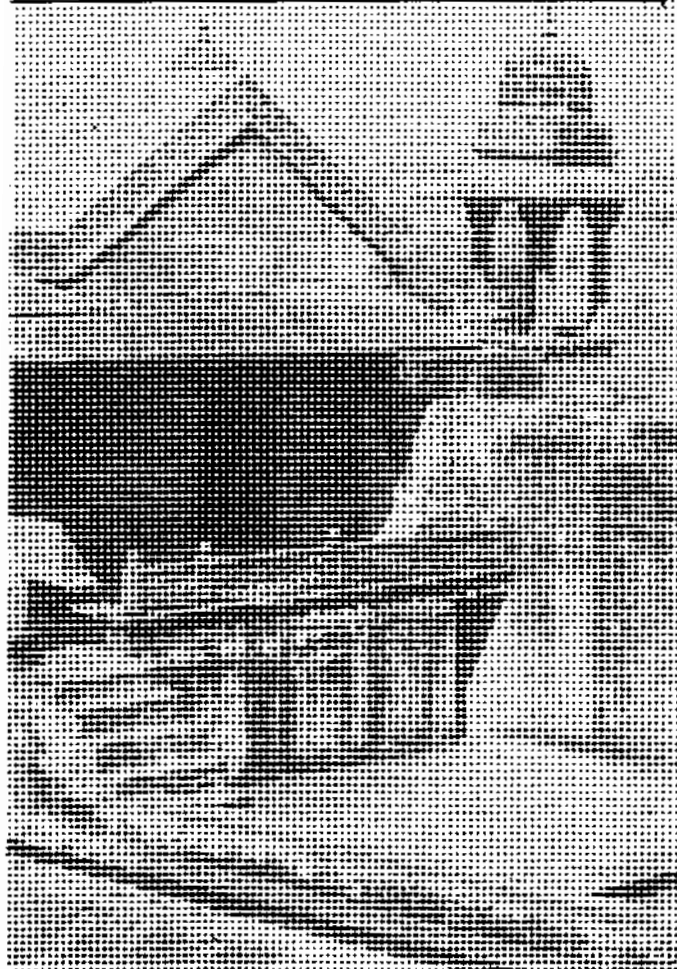
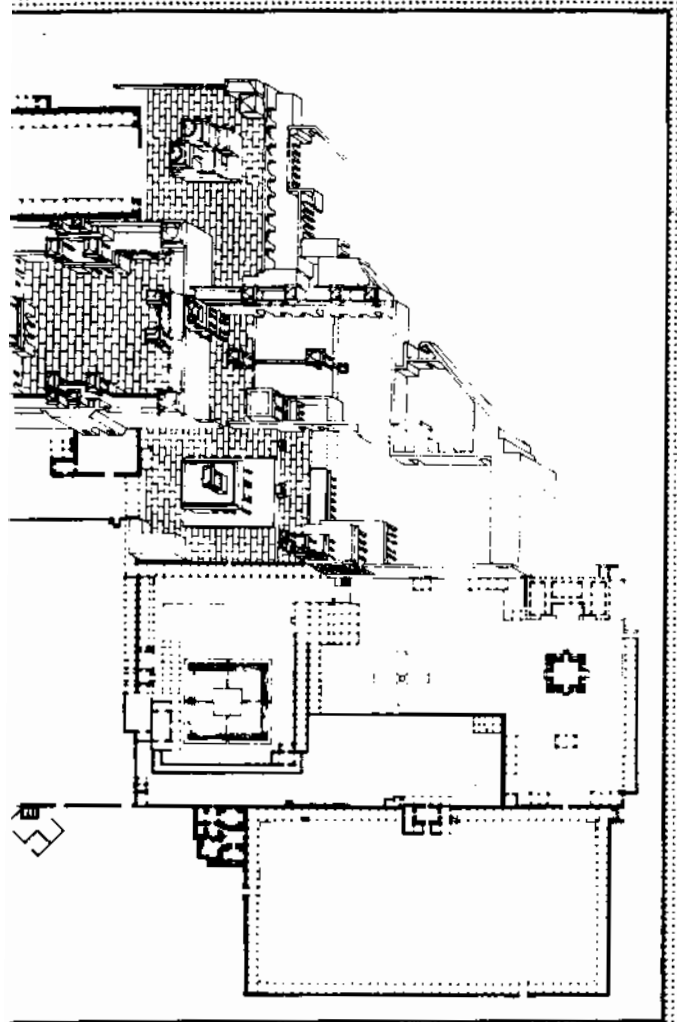
According to the former, in a first phase, Akbar's residence was behind the Jami' Masjid and very close to its northern gate; it consisted mostly of Jodh Bai's Palace or the now empty open space entered through the Hatyapul to the right. Only with the later extension of the palace complex to the east was the Divan-i 'Amm given its present form and position. All the bazaar services would have been turned toward the Agra Gate. This hypothesis is said to be borne out by the presence of the main entrance to the Divan-i 'Amm in the Hawz-i Shirin [85] square situated at a lower level on this first slope.

Considering the different character of the two bazaars, it is possible to imagine a simultaneous dual-function access (fig. 3.6). The first would have been through the Hatyapul which, making ample use of already existing structures, would have led, after an entrance to the harem behind it, to the Hawz-i Shirin square. The second would have been from the Agra Gate.

The pre-existence of an urban settlement does not in any way detract from Akbar's genius as a city builder, nor does it authorize us to think that the new city grew up bit by bit. On the contrary, the urban layout makes ample reference to the passion for geometrical order mentioned earlier, both in its utilization of certain pre-existing items as compositional givens and through the reorganization of the whole city into a composition that was as unified as possible.¹⁹ For the first time all the devices tried previously are brought together in a systematic global vision. A decisive role is played—as decisive as that of Humayun's tomb in Delhi—by the Jami' Masjid, both in the orientation of the whole urban composition (the monumental part of the palace is developed parallel thereto) and in its visual and symbolic impression (it rises on the highest part of the ridge at an elevation of forty-five meters). The residential districts of the nobles also had to take account of it: the district to the west of the quarters of Salim ad-Din Chishti and his family was rotated by forty-five degrees.²⁰

Another preponderant element was the continuous pattern of the gardens which covered a fair part of the flattish areas to the northwest and southeast of the ridge. Here, the garden starts to play the role of protagonist in the urban design, even if it does not have the function of backbone to the whole composition, as it does in the long Chahar Bagh of Isfahan, built some forty years later. The use of large artifi-





cial water basins mirroring the built-up façade of the city follows a standard practice in medieval India, with many examples surviving of both Hindu and Muslim origin—suffice it to cite the Hauz Khass in Delhi and many Rajput settlements in Rajasthan. The descent to the water almost always has a symbolic meaning emphasized by architectural interpolations: the Ajmer lakeside promenade, for example, with the *barahdaris* of Shah Jahan, and the Udaipur and Alwar embankments. The line of the embankment at Fatehpur-Sikri can be partly traced on land, but it is not possible to establish whether it was merely a bank or something more monumental.

There is a definite use of axiality enforced both by the monumental road alignments and by abstract geometrical references. In no case, however, are the axes linked to bilateral symmetries, and therefore they do not have the rigidity typical of the Red Fort in Delhi; they might be defined more as balancing axes than as symmetrical ones. In the main alignment, the 800-meter-long bazaar, which joined the Agra Gate with the palace, broken only in the final stretch by the Chahar Suq or *naqqarakhana*, reaches the Divan-i 'Amm with a rotation of about thirty-five degrees. In the Delhi Red Fort it is perfectly aligned and perpendicular. Studying Akbar's palace, we find an application of the second type of axiality. Here, a system of five vertical axes and four horizontal ones identifies the position of joints and volumes characterized by bilateral symmetry (fig. 3.7). No one axis prevails, thereby creating a hierarchy of "weights." Axis A4, for instance, which structures the whole *mardana*, or men's zone, links the Divan-i Khass [63] and the Daftarkhana [68], but passes at a slight tangent by Akbar's private room [54]. The horizontal axis B3, which crosses a number of small buildings in a single segment and would appear to contradict what has been stated earlier, in fact links volumes of only bilateral and not four-sided symmetry. Raja Birbal's House [44] is placed on the smaller side of the rectangular cut of the stables [46] in such a way that its central axis is in the center of the window of the first building. By this means two shifts are made, giving rise to two divergent apertures and stressing their character as a ninety-degree angle. We are a long way from the quiet cross-shaped symmetry of Humayun's tomb.

In the attempt to control the unitary form of the city, for the first time the modular grid, of casual help to the designer, becomes a systematic design instrument on all scales (fig. 3.8). The whole city, the sweep of the walls, the opening of the main gates, and the road network, are based on a grid of 8 squares of 1,000 *ilahi gaz*, equalling 20 *tanab* per module. Each of these in its turn, through a grid based on sub-modules of 500 and 250 *ilahi gaz* (20 and 10 *ban*, respectively), sets the dimensions of the different districts and the architectural structures.²¹ The middle vertical segment and the upper horizontal external one intersect at the Hiran Minar, probably chosen to be "mile zero," the starting point for the grid. This is a cosmological vision of measurement viewed as order. The city was inserted in a

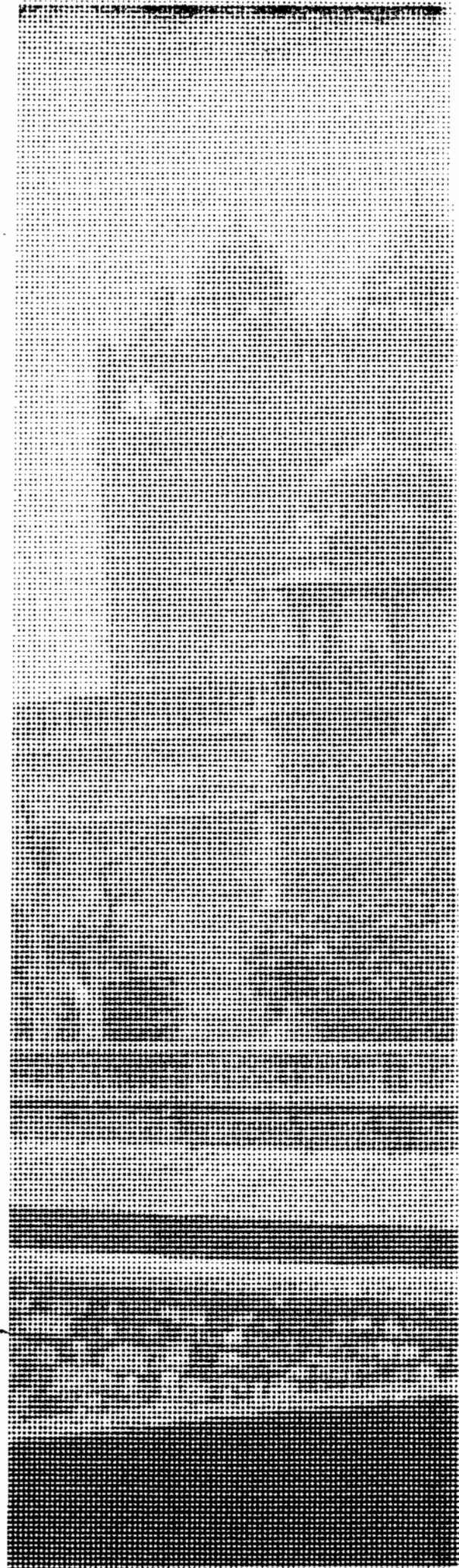
territorial framework that was in its turn wholly geometrized and measured through the system of *kos minars* (mileposts), even if the road network obviously cannot constitute an isotropic grid like the architectural grid (fig. 3.9).²²

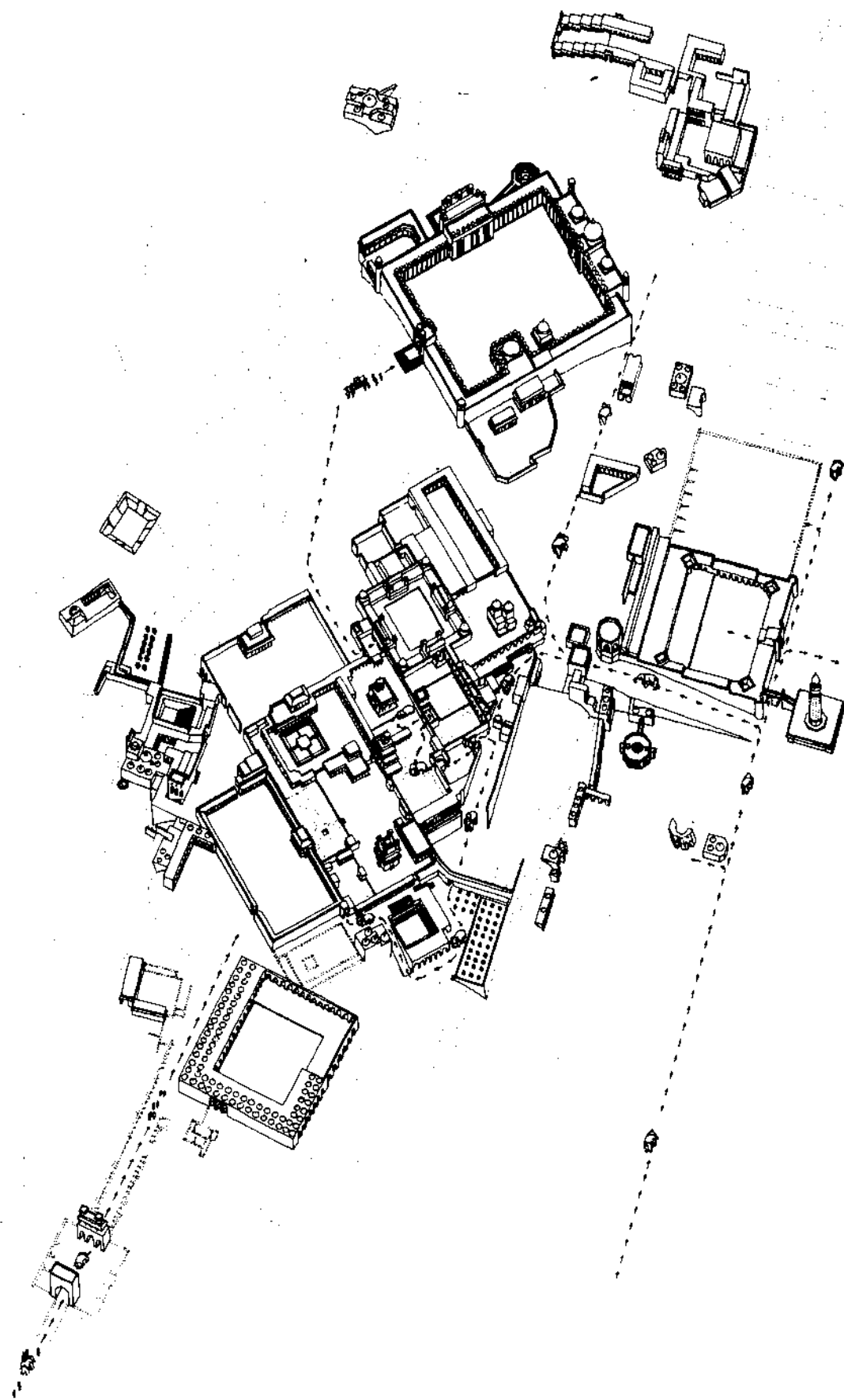
Observing the plan at a scale 1:500 enables us to note how superimposed over the articulated composition of Mughal architecture the same module is used in the analogous buildings and gardens of Akbar, Babur, and Jahangir, and then abandoned by Shah Jahan who, as we know, brought about a revolution in both architectural taste and metrology. Even if the change of the value of the Shah Jahani *gaz* from forty-one to forty *angost* may be negligible at such a large scale, it most likely involved the whole metrological system and brought about the abandoning of the *ban* module.²³

An inquiry of this type carried out in a more systematic way could prove effective in solving problems of dating. Metrological criteria applied to the Lahore Fort should as easily as their stylistic characteristics lead to the identification of the Akbari and Jahangiri buildings.

Leaving aside for a moment the unquestionable efficacy of the grids, a more general question arises: what conceptual value does the module or the grid stemming from it take on in the design? Is it a simple instrument for drawing, like a sheet of squared paper, or does the module become laden with cosmological values as in the Hindu world, where each quadrant may be seen to house a divinity, or in the Islamic world, as Nasr would have it? I believe that the esoteric permeates the whole culture of this epoch and that therefore the modular system adopted at Fatehpur-Sikri in such a diffuse manner tends to reflect a profound view of nature and should, above all, be viewed as underlying aesthetic relationships. As in Vitruvius, the metric principle prevails in the module and thus acquires a meaning, not for itself, but only as a participant in a process of *commodulatio* (and herein lies the modernity of its use at Fatehpur-Sikri): that is to say, it becomes itself a principle of design. Supporting this argument, the works and the "traditional architect" possess the space "seen from inside" of a series of conventions dictated by tradition. A design following the lines of a grid is not, as it appears to us Cartesians, an abstract instrument of representation, but already possesses all the valences of space.

I do not think that in practice the Mughal architect went beyond a plan of the foundations in the graphic representation of his buildings. But in an architectural operation of the range and scope of the palace of Fatehpur-Sikri, the design instruments, such as the modular grid and the balancing axes, are revealed to be insufficient. The grid especially, liable as it is to conceptual expansion ad infinitum, can foster the uncontrolled growth of a complex which by its intrinsic nature cannot be enclosed and limited from the exterior with instruments that do not belong to its internal logic. A ductile, effective instrument to bring back under control the centrifugal growth of the palace spaces is the harmonic layout or guiding alignment. In this case, where the terrain has prevented a composition of balanced squares





and rectangles such as in the Red Fort in Delhi (to the great advantage of architecture), the application of the properties of the dynamic rectangle enables the problem of the slipping rectangular cross-section to be better resolved, keeping them tied to the two and three series of rectangles used. In the Salim ad-Din Chishti district, the golden rectangle would seem to have prevailed.²⁴ There is no doubt that similar results would assuredly be reached by applying the same criteria of analysis at a smaller scale.

NOTES

1. Ibn Hasan, *The Central Structure of the Mughal Empire* (1936; rpt. New Delhi: Munshiram Manoharlal, 1970); W. H. Moreland, *The Agrarian System of Moslem India* (Cambridge: 1929); Irfan Habib, *An Atlas of the Mughal Empire* (Delhi: Oxford University Press, 1982).

2. The now outdated theory of this German scholar on the service centers is applicable only in the presence of settlements evenly spread over the territory; a condition that the geographer Spate finds evidence of in the Yamuna and the Doab plains. O. H. K. Spate, A.T.A. Learmouth, and B. H. Farmer, *India, Pakistan and Ceylon. The Regions* (London: Methuen, 1967), p. 557.

3. Ahmed Enayat, "Origin and Evolution of the Towns of Uttar Pradesh," *Geographical Outlook*, January 1956, pp. 38-58.

4. On the *kos minar*, see Archaeological Survey of India, "Kos Minars Making Lines of Old Mughal Roads," *Annual Progress Report, Northern Circle*, 1914, pp. 45-51; Jean Deloche, *Recherches sur les routes de l'Inde au temps des Mogols* (Paris: Maisonneuve, 1968), pp. 32 ff.; H. C. Verma, *Medieval Routes to India* (Calcutta: Naya Prokash, 1978). On bridges and minor structures, apart from the works already cited by Deloche, see Jean Deloche, *Les ponts anciens de l'Inde* (Paris: Maisonneuve, 1973); S. Sabahudin, "The Postal System during the Muslim Rule in India," *Islamic Culture* 18, no. 3 (1944): 275 ff. A Persian manuscript kept in the India Office Library describes in detail the road between Lahore and Delhi with all its stages. Many of the buildings, whether converted or in ruins, still exist. Aligarh Muslim University is conducting a systematic survey of all the Moghul structures existing on the road between Agra and Ajmer.

5. Glenn D. Lowry, "Delhi in the 16th Century," *Environmental Design: Journal of the Islamic Environmental Design Research Centre* 1 (1983): 7-17.

6. Despite a growing interest in the Moghul garden, none of the books cited below mentions this evolutionary aspect. In a recent book, I started to analyze the very close relationship between the design of the garden and the design of the town in the Indo-Persian area; see my *Dar al-Islam: L'architettura del territorio nei paesi islamici* (Rome: Carucci, 1985), especially the chapter entitled "La città come il giardino e il giardino come la città." On the Indo-Persian garden, see Sylvia Crowe and Sheila Haywood, *The Garden of Mughal India* (London: Thames and Hudson, 1972); Elizabeth B. Moynihan, *Paradise as a Garden in Persia and Mughal India* (London: Scholar Press, 1982).

7. Satish Davar, "Imperial Workshops at Fatehpur-Sikri: The Royal Kitchen," *AARP* (June 1974): 28-42.

8. Various results of the survey work are published in a number of articles. In addition to my thesis, "Questioni di architettura e di urbanistica nell'India Moghul: Fatehpur Sikri," Faculty of Oriental Languages and Literature, Venice University, 1980, see idem, "The Process Evolved by Control Systems of Urban Design in the Mogul Epoch in India," *Environmental Design*, 1 (1983): 18-2; idem, "The Moghul Territorial Structure in the Age of the Great Empire 1556-1703," *Lotus* 34 (1982): 128-31; idem, "C'era una volta in India. Note su una grande capitale," *al-Farabi* 4 (1984): 54-56.

9. The *karkhana* thesis is formulated in S.A.A. Rizvi and V. J. A. Flynn, *Fatehpur-Sikri* (Bombay: Taraporevala, 1975).

10. In Muhammad 'Arif Qandahari's *Tarikh-i Akbari*, (Fatehpur-Sikri: A Sourcebook [Cambridge, Mass.: Aga Khan Program for Islamic Architecture, 1985], p. 84): "In the months of the year A.H. 984 (1576-77), a compulsory decree was issued that fine shops (*dakakin*) of red stone, mortar, and lime should be constructed from the royal court (*darbar-i padshahi*) to the gate (*darvaza*) which faces toward the *dar al-khilafat* of Agra, and close to the court (*darbar*) a market place (*chahar suq*) comprised of well-decorated shops (*dukkanha*) was built."

11. E. W. Smith, *The Moghul Architecture of Fatehpur-Sikri* (Allahabad: Archaeological Survey of India, 1894-98), 3:39-40.

12. The little octagonal pavilion of mixed structure was used as a reference for the alignment of the wall. If the pavilion had after the wall it would not have been built so close behind it off one of the main accesses.

13. Cases cited in Kulbhushan Jain, "Fatehpur Sikri: Some Unanswered Questions," *Design* (July-September, 1983): 37-46.

14. The Hawa Mahal itself is a later addition. The addition of a structure with high, protected sides and of a structure of *jali* screens such as the Hawa Mahal supports the hypothesis that Jodh Bai's Palace was into a harem.

15. The fabulous figure of 200,000 inhabitants has no scientific inclined to reduce the number to about 30,000. Only a few army could be camped in the plain because of the little water available; the army was located not far away, probably at Bayana; the noble and less noble houses between the Agra Gate and the 600-700; multiplied by 10 persons per house the result is 7,000 court could not have included more than 500 nobles and officers adding another 500 officials with their families among the nobles yields a total of about 4,000. Nonetheless, it was a great undoubted architectural and urban planning.

16. "... and had apartments prepared for the Mirza in the town of Fatehpur, where was the Naqarah-khanah" (Abd'l Qadir Muntakhab at-Tavarik [Sourcebook, p. 106]).

17. Attilio Petruccioli and T. Terranova, "Modelli culturali nella storia delle trasformazioni di Old Delhi," *Storia della Città* 31 (1985): 1-10.

18. In fact, when Fatehpur-Sikri became the seat of the Mughal emperor, the palace was remodeled both inside and outside. Remains of structures of the typical baked brick of the period are visible alongside the ticket offices.

19. Fatehpur-Sikri is not the only example. We quote here only Shahjahanabad (1639) built on a grid of 500 *ilahi gaz*, but in pre-existing line of the Fayz Bazaar, and Jaipur (1725), inspired by Delhi and built on a grid of 1,000 *ilahi gaz*.

20. The reason why the Jamī Masjid lacks a northern gate remains a mystery. The only plausible explanation is that part of the quarters, especially an extension of the harem, was situated there.

21. Petruccioli, *Questioni di architettura*, see the chapter "La misurazione e teoria delle proporzioni nell'India Moghul."

22. Indirect confirmation of the extensive use of the grid system by architects is found in a miniature from the ca. 1589 *Baburnama* and Albert Museum, London) showing Babur in a garden architect. The architect is holding a squared board; see E. W. Smith, "Graphic Evidence for Mughal Architectural Plans," *AARP*, 1974, pp. 22-23. I infer that it was common practice among architects of the period to design at least the plan of the building on paper. See Habib, *Atlas of the Mughal Empire*, appendix A, pp. 1-10. 24. See Klaus Herdeg, *Formal Structure in Indian Architecture* (1967).