

DESIGN WITHOUT REPRESENTATION IN MEDIEVAL EGYPT

Today when we think of architecture we immediately think of design, the creative act of conceptualizing a project in all its functional, spatial, structural, mechanical, and decorative components and then representing this conceptualization to all parties concerned: the client, the contractor, the builders, the users, and so on. We also expect to have a qualified individual or a group of individuals who will be responsible for carrying out this task. This individual is the designer or, more specifically, the architect, a professional with a theoretical and practical knowledge of buildings and a thorough training in modes of representation in architecture through a set of prescribed conventions: perspectival, planar, and/or sectional drawing, modeling, and, recently, computer rendering. But this notion of design is neither static nor universal. It of course has a history, which, like all other normative histories, includes certain canonized episodes and ignores other problematic or exotic ones.¹ Identifying and fleshing out the neglected chapters of design history will redress some of the biases marring the standard version of world architectural history; it will also enrich our understanding of the act of design itself as a variable that depends not only on conceptual or technological conditions in a homogenized historical trajectory but also, and perhaps to a greater extent, on cultural choices. The role of choice is at least suggested by a short remark on design in twelfth-century Egypt by an Iraqi doctor, ‘Abd al-Latif al-Baghdadi (1162–1231). This article will try to explain how and, in a more tentative vein, why al-Baghdadi’s note highlights a different and uncommon definition of design that does not obtain in our regular histories. My interpretation is a tribute to Oleg Grabar, who taught generations of art and architectural historians how to allow educated speculation to inform alternative readings of the limited available historical evidence.

Designers with a combination of conceptualizing and rendering skills—with varying emphasis on one or the other depending on available technologies,

training, and sociocultural context—appear from at least as early as ancient Egypt. Imhotep, a polymath who served Pharaoh Djoser (Zoser) (r. ca. 2630–ca. 2611 BC) in many capacities, is considered the first true architect in history and credited with the stepped pyramid at Saqqara.² Famous architects appear in every subsequent classical and medieval culture, from Greece, Rome, and Byzantium to the Islamic world, India, and China, with celebrated paradigmatic buildings ascribed to them. But the recognition of the architect as the main intellectual and creative force behind all building projects did not become the norm anywhere until the emergence of the architect-humanist in Renaissance Italy.³ Many Quattrocento architects became model humanists in the eyes of their contemporaries because they rediscovered the aesthetic canons of the ancients by deciphering classical texts and analyzing architectural remains in major Italian cities. Ultimately they transformed architecture into a highly distinguished and intellectually intense profession, first in Italy and soon afterward, with the spread of the Renaissance ethos, in other European countries.⁴ As a result, architecture acquired a conceptual and organizational framework, and architects began to reflect on design and its epistemological parameters by publishing books, planning teaching curricula, and establishing schools that prescribed academic norms. Architecture thus became both an academic discipline and a profession.

In the medieval Islamic world, like everywhere else in that period, architecture was essentially a craft. It depended on apprenticeship rather than formal or abstract education and seems not to have generated its own literature, be it technical or theoretical, or to have inspired thinkers and authors to write about it.⁵ This is evident from the dearth of architectural discussions in all genres of historical writing, but it is most revealing in the quasi-total absence of building professionals from the biographical dictionaries that constituted the main record of distinguished people

in the medieval Islamic world. In these compendia, which typically include thousands of individuals from all walks of life, builders rarely appear, and, in the exceptional instances when they are mentioned, it is only in the briefest and barest biographical accounts,⁶ consisting of their names and some cursory remarks about their buildings but including practically nothing about their training, the texts they read, the skills they needed to qualify for their positions, their modes of thinking, their design concepts and ways of representation, or their professional organization and social standing. On the whole, medieval architects appear to have occupied a rather modest position in the social hierarchy, and those among them who rose up in society did so through means other than excellence in design, such as wealth or literary or theological accomplishments.⁷ It was not until the sixteenth century that architecture became an organized profession with conceptual and disciplinary frameworks—first in Istanbul, the capital of the Ottoman Empire,⁸ and later in Isfahan and Delhi, the capitals of the Safavid and Mughal empires respectively, before the spread of the model all over the Islamic world in the late nineteenth century, probably under direct European influence.⁹

Nor do we have definite information on the terminology of the building crafts in the medieval period, despite the preponderance of lexical works in both Arabic and Persian, including some that provided whole sections that specialized in buildings.¹⁰ For instance, there seems to have been no single word encompassing the meaning of “designer” or “architect” as we now understand either word. The term *mī‘mār*, used today in most languages of the Islamic world to mean “architect,” appears in the medieval sources only in the sense of “master mason.” *Muhandis* (more correctly *muhandiz*, from the Persian word *hundāz*, meaning “measurement”) seems to be the closest to our “architect.”¹¹ It is the only term that indicates a professional with the wide range of technical aptitudes and practical knowledge that we associate today with architects and civil engineers. Essentially, a *muhandis* was a surveyor with training primarily in geometry and perhaps hydrology, which he may have acquired through a combination of apprenticeship and formal education (although we know nothing about the structure of that education). In Fatimid, Ayyubid, and Mamluk Egypt and elsewhere in the medieval Islamic world, a *muhandis* was mainly responsible

for the building of bridges, canals, aqueducts, and the like. His architect-like role derived from his engineering background and function. In an urban context, his expertise was called upon to check boundaries between properties, to estimate values of real estate, to assess the structural integrity of buildings, and, in a very few instances, to “design.”¹²

“Design,” however, seems less a description than an approximation of what a *muhandis* did in the medieval period. He apparently did both more and less than what a modern designer does, partly because he was by training a surveyor, often with hands-on experience in one or more of the actual building crafts—stone masonry, carpentry, and the like—but also because “design” was differently conceived. Though no medieval Islamic commentator notes the actual *modus operandi* of the *muhandis*, a valuable observation by the Iraqi physician ‘Abd al-Latif al-Baghdadi, an exceedingly sharp and perceptive resident of Cairo in the later part of the Ayyubid period (he finished writing his text in 1206), gives us an idea of the Egyptian *muhandis*’s approach to “design.”¹³

‘ABD AL-LATIF’S REPORT

An indefatigable inquirer and researcher, ‘Abd al-Latif al-Baghdadi dabbled in all areas of knowledge of his time. He wrote many books, in fields ranging from medicine to theology, mathematics, and history. Only a few of his writings are extant, some only as long quotes in other authors’ work or in Latin translation. An extract of a huge compendium on Egypt that he composed during his intermittent residence in Cairo between 1190 and 1206 survived and was translated into Latin, German, English, and French. This short book, entitled *al-Ifāda wa ’l-i’tibār fī ’l-umūr al-mushāhada wa ’l-hawādith al-mu’āyana bi-arḍ Miṣr* (Benefit and Lessons from Things Observed and Events Examined in the Land of Egypt), provides a first-hand and lively account of the flora, fauna, people, and monuments of Egypt, in addition to a chronicle of the years ‘Abd al-Latif spent living there. But the most exceptional aspect of this text is the elaborate terminology ‘Abd al-Latif uses in describing Pharaonic statues, which reveals not only a keen sense of observation and a sophisticated artistic sensibility but also a palpable familiarity with classical aesthetic concepts. The same qualities seem to have informed his account of con-

temporary building practices. In the section describing the manners and customs of the Egyptians, for instance, 'Abd al-Latif notes,

إذا أرادوا بناء ربع أو دار ملكية أو قيسارية
استحضر المهندس وفوض إليه العمل فيعمد إلى
العرصة وهي تل خراب أو نحوه فيقسمها في
ذهنه ويرتبها بحسب مايقترح عليه ثم يعمد إلى
جزء جزء من تلك العرصة فيعمر ويكمله بحيث
ينتفع به على انفراده ويسكن ثم يعمد إلى جزء
آخر ولايزال كذلك حتى تكمل الجملة بكمال
الأجزاء من غير خلل ولااستدراك

Should someone want to build a *dār* [house, somewhat on the fancy side but not necessarily a palace], a caravanserai, or a *rab'* (tenement house), he would hire a *muhandis* who would then divide the empty lot in his mind and arrange the laying out of its parts as commissioned. The *muhandis* would then proceed to construct those parts one by one in a way so that he would complete each part in its entirety and deliver it to the occupants before moving on to the next part, until the whole was finished, without distortion or revision [of the original plan].¹⁴

This brief account has not attracted much attention among modern students of Islamic architecture, although 'Abd al-Latif's uniquely insightful book has been in circulation, in various languages, for many centuries. Martin S. Briggs provided an English translation of it, in addition to some perceptive comments, in his book on the Islamic architecture of Egypt and Syria but did not grasp its full significance for the notion of design as understood by a medieval observer.¹⁵ The French scholar Albert Gayet dismissed 'Abd al-Latif's remark altogether, on the assumption that he meant it to sum up the status of design in medieval Egypt in general.¹⁶ This evidently was not 'Abd al-Latif's intention. His list of buildings designed in this non-representational method, for instance, includes only residential and commercial types, those that in all likelihood were more or less standardized in plan and function. He says nothing about monumental or custom-designed structures such as mosques, palaces, madrasas, and the like—building types more

complicated and more innovative in design, which might have required some kind of marking out of their plans before their execution, although this supposition must remain conjectural at the present stage of our knowledge.¹⁷ 'Abd al-Latif also says nothing about the conception of the structural system in the building or about the elaborate articulation of façades, two highly sophisticated aspects of Cairene medieval architecture that may have been planned differently and by different individuals involved in the construction, probably master masons and stone carvers with a serious training in geometry.¹⁸

From the tone of his statement, 'Abd al-Latif was manifestly impressed by what he saw, which was evidently different from what he was used to in his native Baghdad or other places that he visited in his travels, although he does not say what the difference was. He was particularly fascinated by three aspects of the building process he describes, which together indicate a different approach to design in medieval Egypt, an approach that might persuade us to reevaluate our received understanding of design and its historical evolution. First is the mental imagining and visualization of the architectural plan and structure without the idea being translated into some graphic or visual representation or model. Second is the sequential execution of the structure's components so that they can be completed and used autonomously as the rest of the building is still under construction, and still without a represented overall plan. This remark of course bolsters the singularity of the mental visualization as it confirms its validity in practice, at least as observed by 'Abd al-Latif. Third is the apparent efficacy of the method, with the building completed as planned and the alignment of its different components achieved without mistake. It is of course difficult to ascertain that the plan was completed as envisaged, since there is no graphic referent to check it against, but the implication is that the viewer anticipates the building's having a certain shape and the designer accomplishes this. Here we have an indication of a shared architectural expectation between the designer and the viewer/user, possibly based on their common knowledge of the basic architectural types and general forms appropriate for each major societal function (housing, trading, praying, etc.). But the most important and tantalizingly suggestive aspect of the report is its confirmation of the existence, in Egypt at least, of a design technique without representation.

Of course ‘Abd al-Latif does not mention anything about the opposite method, i.e., design *with* representation, the method that we all know and usually take for granted as universal. But in his astonishment with the Egyptian case, ‘Abd al-Latif is implying that he and, one may assume, his reader are accustomed to that other method, which may be said to have been the normative one in his days, as it is today, so that he felt no need to mention it. In fact, the way the report unfolds indicates that there existed at least two design methods, one peculiar to Egypt as observed by ‘Abd al-Latif and another, presumably representation-based, common in other places like Baghdad and elsewhere in the Abbasid cultural sphere, with which ‘Abd al-Latif, being an avid traveler, was familiar.¹⁹ An Egyptian *muhandis* visualizes the building and then successfully completes its construction without the intermediary stage of a mode of representation for the patron and the builders. By contrast, an Iraqi or Iranian or Jeziran *muhandis*, we are led to infer, may customarily use some form of representation to communicate his design concept. Yet, though ‘Abd al-Latif does not spell it out, the difference may have been less a result of a cognitive limitation than a question of choice. That is, conceptualizing a building without representation may have been specifically used in Egypt not because the Egyptian *muhandisūn* were unaware of the other method, but because they preferred or were more comfortable with this one, or perhaps considered their use of it to be the mark of their distinction. But despite ‘Abd al-Latif’s silence, they do not seem to have held on to their method exclusively; they might even have had some kind of rule for the choice of method—representation or just mental conceptualization—that depended on the type of the building projected or the patron’s desire for innovation.

DESIGNING WITH REPRESENTATION

Representing a monument before constructing it was a process known throughout the medieval Islamic world. The various methods of representation used, however, seem initially to have been influenced by whatever artistic tradition prevailed in any specific region prior to the coming of the Muslims: Byzantine and Roman in the western half of the Islamic world, and Iranian or Indian in the eastern half. The earliest historic references to some form of representation come to

us from the Umayyad period, with the story about the building of the Dome of the Rock providing the most elaborate account. When ‘Abd al-Malik ibn Marwan, the fifth Umayyad caliph (r. 683–703), decided to build the Dome of the Rock in Jerusalem, he asked the selected builders to provide him with the description (*ṣifat*) and form (*ṣamt*) of the planned dome before he engaged in its construction. The sources say that it was marked (*kurrisat*) for him on the platform upon which the actual dome was to be built.²⁰ The word *kurrisat*, used in the reports to convey the way the Dome was represented to ‘Abd al-Malik, does not denote any usual act of representation, such as drawing or model making. The key verb, *k-r-s*, has several meanings, two of which could be construed as acts related to building. The first is “to stack the components of the foundation of a building,” and the second is “to enclose by marking.”²¹ This may mean that the builders either delineated the plan of the dome on the floor of the platform, or that they built the foundation of the building for ‘Abd al-Malik to verify the location, the plan, and possibly the shape of the Dome in situ before he gave his assent.

The next well-known instance of representing a structure before its construction comes from the beginning of the Abbasid period. It is the foundation in 762 of the round city of Baghdad by the second Abbasid caliph, Abu Ja‘far al-Mansur.²² Having chosen the site after a careful search that took several years, al-Mansur is credited by most chroniclers with supervising the entire process of designing the round city plan and arranging its layout and internal organization following mathematical and astrological considerations. He is said to have ordered that the plan of the city be traced on the ground with ashes so that he could visualize it. When he walked through the site, he ordered cottonseed placed along the ash marks, doused with naphtha, and set aflame.²³

Islamic written sources offer several accounts of other examples of design representation in the classical period (seventh to tenth century), but architectural representation definitely became visible in Iran and further east after the Mongol invasion of the early thirteenth century and was later exported from Central Asia south to Mongol India and west to the Ottoman Empire, where it was synthesized with Mediterranean methods and conventions. This deduction is corroborated by a series of written references in addition to actual plans of buildings, preserved on plaster slabs, parchment, and paper, that date from the

Ilkhanid period (1256–1352) and the Timurid and post-Timurid empires.²⁴

From Egypt, we have a few written references from various periods but no material evidence until the nineteenth century of monuments being represented by drawings for their patrons before construction.²⁵ It is very difficult from these instances to estimate the extent to which this method, as opposed to the mental conceptualization method observed by ‘Abd al-Latif, was used. Nor can we establish with any certainty whether the two methods coexisted indigenously all along, or whether the representation method was introduced—or reintroduced, if we bear in mind that ancient and classical Egypt knew some form of architectural representation—into Egypt from the East. Judging by the scant evidence of the written sources, it seems to have been called for only in specific and genuinely outstanding cases such as the madrasa of Sultan Hasan, which may have been influenced by eastern traditions and perhaps even built by eastern builders.²⁶ In the mid-fifteenth century, the historian Khalil al-Zahiri reported that

Sultan Hasan, when he ordered its construction, summoned all the architects (*muhandisin*) from all the countries and asked them, “Which is the highest building in the world?” He was told, “Iwan Kisra Anushirwan [the Iwan of Khusraw, at Ctesiphon].” So he ordered that the iwan should be measured and revised (*yuharrar*) and that his madrasa should be 10 cubits higher than it, and it was thus constructed.²⁷

In this anecdote, “Iwan Kisra” is clearly the model for the proposed madrasa. But what is more important for our analysis is that it was measured and the measurement transmitted—possibly as a drawing, although we cannot tell from this or any other source.

While the role of architectural representation may remain conjectural in the case of the madrasa of Sultan Hasan, one well-known report suggests that this method was indeed used for the much earlier mosque of Ibn Tulun (878). The plan of the mosque, we are told, was rendered on animal skin for Ibn Tulun to see before he committed to its innovative structural solution.²⁸ This was doubtless an imported practice, since the mosque of Ibn Tulun, though built in Cairo, was of an Iraqi Abbasid provenance,²⁹ clearly modeled after the imperial prototypes of Samarra. Moreover, to judge from the word al-Maqrizi uses to describe its designer—*naṣṣrānī* (Christian) rather than *qubṭī* (Copt, the designation generally used for Christian

Egyptians)—the mosque was most probably built by a Christian Iraqi architect, who may have arrived in Egypt in the entourage of Ibn Tulun, and who potentially was accustomed to representing his design to his patron as reported.³⁰ The mosque may have been novel and unusual to the Egyptians, as suggested by the various myths that seem to have been spun around its construction, financing, and predicted fate, although to an ex-resident of Samarra, its features would have been quite familiar and its proposed structural scheme the norm. Although probably typical of the eastern Islamic approach to design, its representational design method may likewise have been foreign to Egypt and considered worth mentioning by al-Maqrizi, either because of the medium used—animal skin—or because of its marked contrast to the customary practice of design without representation.

CONCLUSION

This is how ‘Abd al-Latif’s remark acquires its full significance: if al-Maqrizi’s account indirectly suggests the use of the no-representation method in Egypt, ‘Abd al-Latif’s remark explicitly confirms it. Taken together, the two observations also suggest that the use of this method extended over many centuries (at least from the ninth to the twelfth), and that it was paralleled by the other method—design with representation—which was practiced outside Egypt.

Aside from enriching our knowledge of historical design methods in the Islamic world, such a tentative and admittedly overstretched conclusion warrants a few methodological observations about our current understanding of design in general. Imagining and conceptualization have always been recognized as formative stages in the process of design. But visualization and graphic or three-dimensional representation in some fashion are normally seen as necessary and inevitable steps in the transformation of design from idea to communicable visual image. Omission of the graphic phase has usually been thought to apply only to straightforward vernacular architecture that followed age-old rules of spatial organization and did not require much precision in execution. Thus it is understandable that a one-room house or hut would not require representation for its construction. But for anything more complex, the general expectation is that a design of some sort must have been produced, graphically or spatially, prior to construction. ‘Abd

al-Latif's remark shatters this easy and evidently simplistic dichotomy: vernacular/no representation versus designed/representation. A complex design based on a mental concept can apparently be communicated and executed without an intermediary stage of representation. At least this is what some architects in medieval Egypt achieved and seem to have preferred, since the method of designing with representation was known to them and even practiced among them simultaneously with the more cerebral method.

Nor would the notion of a shared typology explain the design without representation as witnessed by 'Abd al-Latif, i.e., a building with multiple components completed incrementally and without any mistake in alignment. It is possible to imagine an architect conveying the design to the builder by referring to an already existing example and asking for a replica or an approximation. It is also possible to think the reference to be to a general type with many known examples within the shared architectural repertoire of both designer and builder (even if they were one and the same). But some representation still seems necessary if for no other reason than to establish the dimensions and proportions of the building and its various components on the ground. It is very difficult to see how a shared typological understanding could obviate the need for a proportioned representation in the case of complex structures unless what is shared is more than a type or a model.

My final speculation, therefore, is that for 'Abd al-Latif's observation to be plausible the shared knowledge between designer and builder should be at the same time typological and arithmetical; that is, what the designer should be verbally communicating to the builder is the type of the building, which establishes the sequence of spaces and their relative relationships to each other, and the numerical dimensions of each of these spaces. The communicated dimensions need not be in any abstract measuring norm. It would be sufficient for the designer to use a modular frame of reference stemming from the construction materials themselves: the dimension of a standard brick plus the number of bricks needed for any side of a regular space could be communicated verbally and reproduced with minimal representation, not exceeding a tracing of straight lines on the ground to establish axes. Of course we know that medieval Islamic builders had at their disposal a host of measuring units such as the various types of cubit, the foot, and the finger. Dimensions using these units can likewise be

verbally communicated, although perhaps with less precision than the fixed dimension of a unit of construction such as, say, a brick, since the understanding of "cubit" and "foot" differed from one locale to another. Perhaps it is no coincidence that the design-without-representation method was used in Egypt, and for the lesser monumental types, which used brick as their essential construction material, whereas religious and palatial structures were built with stone, which would necessitate the use of measuring units. In fact, the method itself may have disappeared from the Egyptian scene with the rising dependence on cut stone as the primary building material for monuments toward the middle of the thirteenth century, not long after 'Abd al-Latif wrote his book.

If we substitute oral communication for representation as the stage between conception and execution, then we begin to see how design can be achieved without representation. We also begin to see how the standard history of design has favored a certain trajectory over another, which of course resulted in accepting representation as a *sine qua non* of design, when alternative historical trajectories seem to have existed and, if we accept 'Abd al-Latif's remark, to have worked. In fact, considering representation a necessary mode for communicating design may be seen as the outcome of the professionalization of both architecture and construction and, more important, of the separation between designer and builder. Both forms of separation are historical choices that arose in specific contexts and times and obscured other choices that existed in other contexts and times. One such choice is the Egyptian experiment in design without representation. Comparable choices may have also existed in other places and other times, but they have largely been overshadowed by the triumph of one model and the subsequent normalization of its history as the only history of design.

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NOTES

1. The most famous canonical episode in the Western tradition is the establishment of an architectural drawing convention in the Gothic period, represented by the portfolio attributed to Villard de Honnecourt and dated to ca. 1230. See Robert Branner, "Villard de Honnecourt and the Origin of Gothic Architectural Drawing," *Gazette des Beaux-Arts* 61

- (1963): 129–46; Christof L. Frommel, “Reflections of the Early Architectural Drawings,” in *The Renaissance from Brunelleschi to Michelangelo: The Representation of Architecture*, ed. Henri A. Millon and Vittorio M. Lampugnani (Milan: Bompiani, 1994), 101–21. A concise overview of the evolution of architectural drawings is François Bucher, “Medieval Architectural Design Methods 800–1560,” *Gesta* 11, 2 (1972): 37–51.
2. Great Buildings online, <http://www.greatbuildings.com/architects/Imhotep.html>; *Encyclopædia Britannica Online*, s.v. “Imhotep”; Adolf K. Placzek, ed., *Macmillan Encyclopedia of Architects*, 4 vols. (London: The Free Press, 1982), 2:454–64.
 3. For an argument against this commonly accepted view see Michael Lingohr, “Architectus: Considerations on a Pre- and Early Modern Age Professional Portrait,” *Architectura (Zeitschrift für Geschichte der Baukunst)* 35, 1 (2005): 47–68.
 4. See Raymonde Moulin et al., *Les architectes: Métamorphose d’une profession libérale* (Paris: Calmann-Levy, 1973), “Ésquisse historique,” 13–36; Leopold D. Ettlinger, “The Emergence of the Italian Architect during the Fifteenth Century,” in *The Architect: Chapters in the History of a Profession*, ed. Spiro Kostof (New York: Oxford University Press, 1977), 96–123; and Catherine Wilkinson, “The New Professionalism in the Renaissance,” in Kostof, *The Architect*, 124–60.
 5. See Nasser Rabbat, “Perception of Architecture in Mamluk Sources,” *Mamluk Studies Review* 6 (2002): 155–76.
 6. Leo Mayer, *Islamic Architects and Their Works* (Geneva: Skira, 1956), 20–27; Donald Wilber, “Builders and Craftsmen in Islamic Iran: The Earlier Periods,” *Art and Archaeology Research Papers (AARP)* 10 (1976): 31–39; Michael Meinecke, “Zur sogenannten Anonymität der Künstler im islamischen Mittelalter,” in *Künstler und Werkstatt in den orientalischen Gesellschaften*, ed. A. J. Gail (Graz: Akademische Druck- u. Verlagsanstalt, 1982), 31–45; Doris Behrens-Abouseif, “*Muhandis, shād, mu’allim*: Note on the Building Craft in the Mamluk Period,” *Der Islam* 72, 2 (1995): 293–309.
 7. See Nasser Rabbat, “Architects and Artists in Mamluk Society: The Perspective of the Sources,” *Journal of Architectural Education* 52, 1 (Sept. 1998): 30–37.
 8. The centralized organization of the corps of royal architects in the early modern Ottoman Empire contributed to their high status as state officers and led to the emergence of Sinan’s autobiography (which is comparable to the lives of Italian Renaissance architects) and the biography of Mehmed Aga. See the preface by Gülru Necipoğlu in Howard Crane and Esra Akın, *Sinan’s Autobiographies: Five Sixteenth-Century Texts* (Leiden: Brill, 2006), vii–xvi, and Howard Crane, *Risāle-i Mi’māriyye* (Leiden: E. J. Brill, 1987). For the prestigious status of Sinan and other architects, who are praised in official chronicles and commemorated by prominent tombs and their own pious endowments, see Gülru Necipoğlu, *The Age of Sinan* (London: Reaktion Books, 2005) chaps. 4 and 5, 127–86.
 9. This is an area that still needs basic research. See Gülsüm Baydar Nalbantoğlu, “The Birth of an Aesthetic Discourse in Ottoman Architecture,” *METU Journal of the Faculty of Architecture* 8, 2 (1988): 115–22; Rifat Chadirji, “The State of Arab Architecture,” *Ur* 1982, 1 (1982): 60–67. See Chadirji’s personal history, *Shāri’ Tāha wa Hammersmith: al-Baḥṭh fī jadaliyyat al-‘imāra* (Beirut: Mu’assasat al-Abḥāth al-‘Arabiyya, 1985), which shows how modern Arab architecture absorbed most of its identity through its contact with the West.
 10. See, for example, vol. 2 of Abū Hilāl al-‘Askarī, *Kitāb al-talkhīs fī ma’rifat asmā’ al-ashyā’*, ed. ‘Izzat Ḥasan, 2 vols. (Damascus: Majma’ al-Lughā al-‘Arabiyya, 1969–70), which devotes more than half of its pages to discussion of building and place terminology.
 11. Mayer, *Islamic Architects*, 26, and Aḥmad Taymūr, *al-Muhandisūn fī l-‘asr al-Islāmī* (Cairo: Dār Nahḍat Miṣr lil-Ṭab’ wa l-Nashr, 1979), 121–22, opt for the term *muhandis*, but as we will see, a *muhandis* is the designer only in the sense of surveying and laying out the plot.
 12. Ibn Khaldūn, *Muqaddima*, ed. ‘Alī ‘Abd al-Wāhid Wāfi, 4 vols. (Cairo: Lajnat al-Bayān al-‘Arabī, 1957–62), 3:935–37, explains how *muhandis* developed from being primarily a surveyor and builder to becoming a real-estate expert and arbitrator. For definitions of *muhandis* see S. D. Goitein, *A Mediterranean Society: The Jewish Communities of the Arab World as Portrayed in the Documents of the Cairo Geniza*, 6 vols. (1967–93), vol. 1, *Economic Foundations*, 113; vol. 4, *Daily Life*, 38–39; Doris Behrens-Abouseif, “*Muhandis, shād, mu’allim*,” 293–95.
 13. For the life and work of ‘Abd al-Latif al-Baghdadi see Ibn Abi Uṣaybi’a, *‘Uyūn al-anbā’ fī ṭabaqāt al-aṭibbā’*, ed. Nizār Riḍā, 2 vols. (Beirut: Dār al-Ḥayāt, 1956–57), 2:683–96; Claude Cahen, “Abdellatif al-Baghdadi, portraitiste et historien de son temps: Extraits inédits de ses mémoires,” *Bulletin d’Études Orientales* 23 (1970): 101–28; Shawkat Toorawa, “The Educational Background of ‘Abd al-Latif al-Baghdadi,” *Muslim Education Quarterly* 13, 3 (1996): 35–53; idem, “Language and Male Homosocial Desire in the Autobiography of ‘Abd al-Latif al-Baghdadi,” *Edebiyat* 7, 2 (1997): *Special Issue, Arabic Autobiography*: 251–65; idem, “A Portrait of ‘Abd al-Latif al-Baghdadi’s Education and Instruction,” in *Law and Education in Medieval Islam: Studies in Memory of Professor George Makdisi*, ed. Joseph Lowry, Devin Stewart, and Shawkat Toorawa (London: David Brown Book Co., 2005), 91–110.
 14. Italics mine. ‘Abd al-Latif al-Baghdādi, *al-Ifāda wa l-‘itibār fī l-umūr al-mushāhada wa l-hawāḍith al-mu’āyana bi-‘ard Miṣr* (Cairo, 1869), 52; idem, *Relations de l’Égypte*, ed. Silvestre de Sacy (Paris, 1810), 295–96.
 15. Martin S. Briggs, *Muhammadan Architecture in Egypt and Palestine* (Oxford, 1924; repr., 1974), 93. His English translation is quite different from mine (perhaps because of the difference in terminology between the beginning of the twentieth century and now).
 16. Quoted in *ibid.*, 93.
 17. This is the case in Syria and Egypt, but the use and long-distance circulation of plans on paper is attested in Ilkhanid Iran. For plans sent from Tabriz to Yazd see Gülru Necipoğlu, *The Topkapı Scroll, Geometry and Ornament in Islamic Architecture: Topkapı Palace Library Ms H. 1956* (Santa Monica, CA: Getty Center for the History of Art and the Humanities, 1995), 3–9.
 18. The sources in fact suggest that masons and carpenters who wished to move up in their profession might undertake the study of geometry as one way of enhancing their professional reputation: see the case of Muhammad b. ‘Abd al-Karīm al-Harithy *al-muhandis* (d. 1204) in Taymūr, *Muhandisūn*, 41–42. A fuller biography of al-Harithy appears in Ibn Abi Uṣaybi’a,

- '*Uyūn al-anbā' fī ṭabaqāt al-aṭibbā'*, 2:190–91. For a general statement see Ibn Khaldūn, *Muqaddima*, 3:937; for the English see *The Muqaddima: An Introduction to History*, trans. Franz Rosenthal, abridged edition (Princeton: Princeton University Press, 1969), 321.
19. On 'Abd al-Latif's travels see Shawkat Toorawa, "Travel in the Medieval Islamic World: The Importance of Patronage, as Illustrated by 'Abd al-Latif al-Baghdadi (d. 629/1231) (and Other Littérateurs)," in *Eastward Bound: Travel and Travellers (1050–1550)*, ed. Rosamund Allen (Manchester: Manchester University Press, 2004), 53–69.
 20. The earliest source to report the event was compiled before 1019. It is Abū Bakr Muḥammad ibn Aḥmad al-Wāsiṭī, *Faḍā'il al-Bayt al-Muqaddas* (Jerusalem: Dār Māghnis lil Nashr, 1979), 80–81, account no. 136. See my translation and analysis in "The Dome of the Rock Revisited: Some Remarks on al-Wasiti's Accounts," *Muqarnas* 10 (1993): 67–75.
 21. The verb's origin has to do with the practice of demarcating the settlement of the bedouins by stacking the solidified dung of their animals. A new meaning of the verb, "to consecrate [a church]," attractive as it may be to explain the act of 'Abd al-Malik, could not have been known at his time. See Ibn Manẓūr (d. 1311), *Lisān al-'Arab*, 15 vols., 65 pts. (Beirut: Dār Ṣādir, 1955–56), pt. 26, 194–95; Ibn Sidah (d. 1066), *al-Mukhassas*, 17 vols. in 5 (Beirut: al-Maktab al-Tijārī lil-Ṭibā'a wa 'l Tawzi' wa 'l Nashr, 1965), vol. 5, pt. 1, 120–21. Neither lexicographer gives the meaning "to consecrate" to the verb.
 22. Charles Wendell, "Baghdad: Imago Mundi, and Other Foundation-Lore," *The International Journal of Middle East Studies* 2, 2 (April 1971): 99–128, esp. 123, denies al-Mansur the ability to have such an aesthetic and symbolic vision and attributes the design to his Persian advisor Khalid ibn Barmak.
 23. al-Ṭabarī, *Tārīkh al-rusul wa 'l-mulūk*, 11 vols. (Cairo: Dār al-Ma'arif, 1960–77), vol. 3, pt. 1, 277; Yāqūt al-Hamawī, *Mu'jam al-buldān*, 5 vols. (Beirut: Dār Ṣādir, 1955–57), 1:682; al-Khaṭīb al-Baghdādī, *Tārīkh Baghdād*, 14 vols. (Cairo: al-Maṭba'at al-Miṣriyya, 1931), 1:67.
 24. Necipoğlu, *Topkapı Scroll*, 3–9, provides a thorough collection of references to architectural drawings mentioned in Islamic sources and to actual examples dating from the Ilkhanid period on.
 25. K. A. C. Creswell, *Early Muslim Architecture*, 2 vols. (Oxford: Oxford University Press, 1932–40) 1:78–79, for a list. Ibn Khaldun's statement in Rosenthal's abridged translation, 320, "they try their utmost to make good plans and build tall structures with technical perfection," cited in Necipoğlu, *Topkapı Scroll*, 6, to propose that plans were drawn for monumental projects in Egypt, is misleading. The original text, though a bit convoluted, does not mention drawing plans at all, nor anything about conceptualizing buildings: see Ibn Khaldūn, *al-Muqaddima*, 3:933–34.
 26. Cf. J. M. Rogers, "Seljuk Influence on the Monuments of Cairo," *Kunst des Orients* 7, 1 (1971): 40–68; Michael Meinecke, "Mamluk Architecture: Regional Architectural Traditions, Evolution and Interrelations," *Damaszener Mitteilungen* 2 (1985): 163–75; Bernard O'Kane, "Monumentality in Mamluk and Mongol Art and Architecture," *Art History* 19, 4 (1996): 499–522, esp. 510.
 27. Khalīl ibn Shāhīn al-Zāhirī, *Kitāb zubdat kashf al-mamālik wa-bayān al-turuq wa 'l-masālik*, ed. P. Ravaisse (Paris, 1894), 31.
 28. 'Abd Allāh ibn Muḥammad al-Balawī, *Sīrat Aḥmad ibn Ṭūlūn*, ed. Muḥammad Kurd 'Alī (Cairo: Maktabat al-Thaqāfa al-Dīniya, n.d.), 180–83.
 29. The same might be said about the plan of the palace drawn for Muḥammad ibn Taghī al-Ikhshid (935–46), who also came from Samarra and who "boasted among the Iraqis of his Egyptian palace," indicating that his audience was perhaps an Iraqi one: see al-Maqrīzī, *al-Mawā'iz wa 'l-i'tibār bi-dhikr al-khiṭaṭ wa 'l-āthār*, 2 vols. (Bulāq: al-Maṭba'a al-Amīriyya, 1854), 2:181.
 30. Al-Maqrīzī, *Khiṭaṭ*, 2:265–67. An unpublished PhD thesis, Tarek Swelim, "The Mosque of Ibn Tulun: A New Perspective" (Harvard, 1994), discusses the foundation story of the mosque as it appears in various sources.