

and his Family Represented as Heraclius and his Family," in *Age of Spirituality: Late Antique and Early Christian Art, Third to Seventh Century*, ed. Kurt Weitzmann (New York, 1979), 35–36, fig. 29.

26. Friedrich W. Deichmann, *Ravenna: Hauptstadt des spätantiken Abendlandes*, vol. 1, *Geschichte und Monumente* (Wiesbaden, 1969), 241ff. and pls. 358, 359 (San Vitale), 123, 342–43 (Sant'Apollinare in Classe); vol. 2 (Wiesbaden, 1976), 273–79 and pls. 404–6 (the Granting of the Autokephalia mosaic in Sant'Apollinare in Classe). See also Otto G. von Simson, *Sacred Fortress: Byzantine Art and Statecraft in Ravenna* (Princeton, 1987), 27ff., pls. 2, 18, for the representations of Justinian and Theodora with their retinues in San Vitale, and 59f., pl. 27, for the "Privilegia" mosaic in Sant'Apollinare in Classe.

27. Delbrück, *Die Consulardiptychen*, 272.

28. See the conclusive remarks of Breckenridge, "The Drawing of Job," 36: "The Coptic monk who added this picture to the manuscript symbolized his biblical king in terms of his own ruler . . . the Coptic artist may well have known of the terrible trials the same emperor underwent later in life—largely due to foreign invasions, but also in the public unpopularity due to his incestuous second marriage. The choice of Heraclius to represent Job may have been more than just fortuitous."

29. Gautier d'Arras, *Eracle*, ed. Guy Raynaud de Lage, *Les classiques français du Moyen Age* (Paris, 1976), esp. verse 5093ff.; see also the Introduction, xv.

30. Wolfgang Stammer, ed., *Deutsche Philologie im Aufriß*, vol. 3, 2d ed. (Berlin, 1962), 641.

31. R. Kautzsch, "Die Herakliusbilder zu Frauombach," in *Studien aus Kunst und Geschichte: Friedrich Schneider zum 70. Geburtstag*, ed. Joseph Sauer (Freiburg im Breisgau, 1906), 509ff.; Wiegel, "Die Darstellungen der Kreuzauffindung," 343, pl. VII, 1.

From: *France and the Holy Land*, ed. Weiss and Maloney. John Hopkins UP, 2004.

The French Connection? Construction of Vaults and Cultural Identity in Crusader Architecture

Robert Ousterhout

In memory of Larry Hoey, who understood these things

THE STUDY OF Byzantine architecture has taught me two important rules of thumb.¹ In this chapter, I will try to apply them to the analysis of crusader architecture. The first rule is that architectural style and construction technique are two different things, although they are often confused. Traditional art history, based on formal analysis and dealing with influences and appropriations, normally addresses style rather than technical concerns. The outward appearance of a building, its decorative aspects, can be discussed without a specific knowledge of how it was built. The same holds true for medieval architectural practices: formal elements could have been seen and imitated long after a building was completed. But construction technique is a different matter, for it is based on specialized knowledge that could only be transmitted through the active participation in a workshop. This is not to say that building technology was privileged information—the so-called secret of the master masons; but simply that many critical details of construction were no longer visible when a building was completed, and thus they could not have been learned from observation alone. This is why architectural historians like myself appreciate partially collapsed buildings: they are much more instructive when we can see beyond the finished surfaces. Medieval architectural technology was passed on through a program of apprenticeship, of "learning by doing," and disseminated by traveling masons.² In a professionally illiterate so-

ciety, the transfer of specialized knowledge required human beings as the vehicles.

The second rule is that the cultural experience of the patron is not necessarily the same as that of the artisan. The history of medieval art and architecture is often written as a history of patronage because the sources tell us about the patrons, not about the artists or builders. But we should *not* assume that because a patron was familiar with the monuments of Paris or of Constantinople that his masons came equipped with the same knowledge. For architecture, patrons could dictate certain things, such as budget, scale, appropriate materials, and liturgical necessities, but in the end, it was up to the masons to translate the patron's wishes into architectural form. A careful reading of relevant documents may thus provide us with a part of the picture, but only a part. It can never replace the close analysis of the building itself.

For the purposes of this study, my test case for the application of these rules of thumb to crusader architecture is the ribbed groin vault. It is the quintessential element of French Gothic architecture, in fact, one of its defining characteristics. The development of the ribbed groin vault was critical for the great technical advancements of the late Middle Ages, allowing for lighter, taller, and more open construction and more spacious interiors.

The construction of groin vaults and of ribbed groin vaults in masonry is perhaps of more interest to specialists in architecture than to historians and art historians, but the details of construction will become important to our discussion. Unribbed groin vaults were used commonly in Roman and subsequently in Romanesque architecture to cover square or rectangular spaces, as, for example, the side aisle or nave bays of a church.³ Technically, a groin vault was created by the intersection of two barrel vaults, the curvature of which was defined by arches on the four sides of the bay. The groin vault provided a versatile structural form that adjusted the weight of the vault to the corners of the bay and did not require thick walls for support. Because of its versatility, the groin vault could be easily used in series, as a modular space covering. When used to cover the nave of a church, for example, the groin vault used in series provided a continuous, flowing space of an even height along the main axis of the building, while allowing for large, open clerestory windows along its flanks. When built on a large scale, however, the groin vault would have required substantial formwork or centering to support its weight during the process of construction, until the mortar had set.⁴

With the construction of groin vaults, one of the critical details was the groins—the diagonal intersections of the vault compartments. In terms of pure geometry, if the diagonal arches formed semicircles, they would have a greater diameter than the arches defining the bay, and the resulting vault would have a

slightly domical form.⁵ If the diagonals were flattened to correspond to the height of the other arches, the geometry would be more difficult to calculate.⁶ In either case, it was problematic to construct an unribbed groin vault in which the diagonal junctures formed smooth lines, and most medieval examples of the unribbed groin vault look a bit wobbly as a result.⁷ By the late eleventh century, ribs were introduced into vault construction, perhaps originally as a simple visual correction to this problem, providing a smooth delineation of the groin, as well as a clear articulation to the structural system.⁸ Over the course of the following century, builders learned that the ribbed groin vault could be exploited to structural advantage, that the ribs could provide stabilization during the critical early stages as the mortar set and the building settled. Perhaps more important, the ribs would have simplified the construction process, functioning as a part of the centering, and they could have supported additional formwork as the webs of the vault were constructed.⁹ Visually, structurally, and constructionally, then, the ribs formed a key component in a Gothic system of vaulting.

Numerous permutations of the ribbed groin vault developed, and the literature on Gothic vaulting technology is voluminous. In the areas where we witness the dissemination of French Gothic architectural style and technology, we find the ribbed groin vault. The history of Gothic architecture in England, Germany, Italy, Bohemia, Spain, and elsewhere begins with the major impetus coming from France, followed by distinctive regional developments that affect both the architectural style and the related building technology.

That said, when we consider the Frenchness of the crusades, it is surprising just how seldom we find ribbed groin vaults in the architecture of the Holy Land. One good reason is, of course, that many crusader buildings were begun before the widespread use of ribbed groin vaulting by the middle of the twelfth century, and we might assume a time lag in the transfer of technology. On the other hand, examination of architectural sculptures often indicates that during the construction process, the decorative programs of crusader buildings were updated according to new trends on the Continent. This is the case, for example, at the Cathedral at Tortosa, where a stylistic progression has been noted in the nave sculptures.¹⁰ The foliate capitals shift from a stylized flat leaf pattern to more naturalistic forms. Should we not expect a similar updating of the structural system? As a building rose, the high vaults would have been the last part to have been completed. Although the building activity at Tortosa apparently extended into the thirteenth century, the nave was covered by a slightly pointed, banded barrel vault. The form corresponds to the high vault of the great abbey church of Cluny, of a century earlier, but it is clearly less sophisticated than the contemporaneous ribbed groin vaults

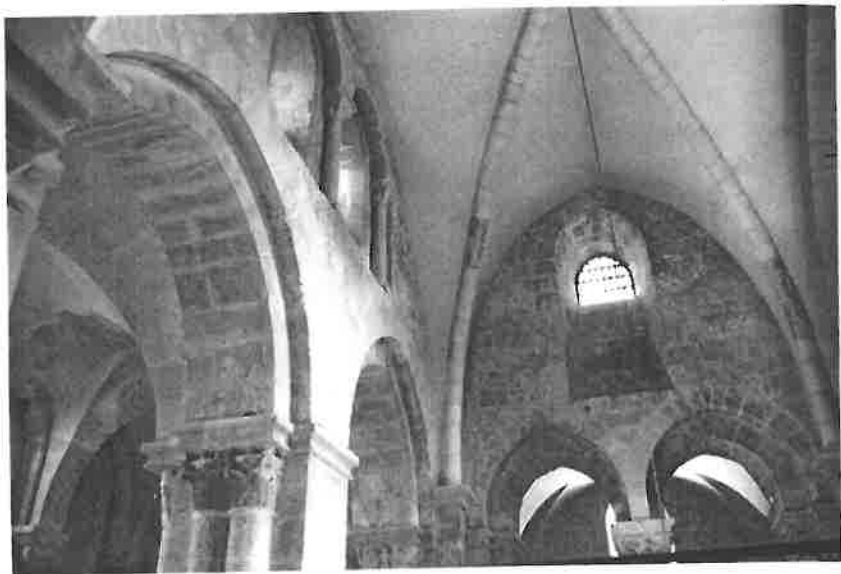


Fig. 5.1. Jerusalem, Church of the Holy Sepulchre, view of north transept, showing ribbed high vault and unribbed vaulting in the gallery, mid-twelfth century. Photo: author.

of the High Gothic. That is to say, the vaulting of Tortosa would have seemed an anachronism by French standards at the time the church was completed.

The first appearance of the ribbed groin vault in crusader architecture is probably in the high vaults of the Church of the Holy Sepulchre in Jerusalem (fig. 5.1).¹¹ The church was reconstructed toward the middle of the twelfth century, at a point in time that coincided with the transition from Romanesque and the early development of Gothic architecture in France. Although they must have been very much *au courant* at the time of its construction, the ribbed groin vaults of the Holy Sepulchre are never mentioned in the historical sources. Obviously, medieval visitors to the church were more concerned with its antiquity than with its novelty.

A careful analysis of the structural system of the Holy Sepulchre suggests that the ribbed groin vaults were afterthoughts, the result of changes in design that came about only *after* the construction was well under way. They appear *only* in the high vaults; the lower vaults are consistently unribbed groin vaults. What is more, the pier sections give no indication that ribs were intended. In the Gothic style, there is normally a pilaster or engaged colonnette of some sort to relate the vaulting rib to the elevation—that is, part of a system of the visual expression of structure, characteristic of late Romanesque and Gothic architecture. The ap-

pearance of the ribbed groin vault should be viewed as one of any number of design changes that occurred during the crusaders' reconstruction of the Holy Sepulchre.¹² This stands in contrast to what occurred, or more correctly, what did *not* occur at Tortosa. But in terms of crusader architecture, the Church of the Holy Sepulchre was an anomaly in almost every way.

The impetus for this particular design change at the Holy Sepulchre must have been the importation of new architectural ideas from France, possibly from the Ile-de-France, at mid-century. Unfortunately, we lack the documents that might tell us by whom and how this feature was introduced, but it was *not* a local development. There is nothing comparable in the prior architecture of the region. The simple rib profile might be best compared with slightly earlier Western examples, such as the side aisle vaults of St.-Etienne at Beauvais (c. 1130–40).¹³ What is critical to our interpretation of the Holy Sepulchre, and of later crusader examples, is how the ribbed groin vault was used. The crusader vaults reveal little of the structural revolution that characterizes Abbot Suger's additions to the Abbey Church of Saint-Denis and its progeny. The stability of the Holy Sepulchre relied on its massiveness, not on its structural design; in spite of the introduction of ribbed groin vaults, it remained solidly a Romanesque building.

Two other early examples are also problematic. At the Cenacle, probably constructed shortly before the fall of Jerusalem in 1187, the interior of the Upper Room is covered by a systematic series of ribbed groin vaults (fig. 5.2).¹⁴ The vaults rest on a row of freestanding columns at the center of the space, creating a sense of openness in the interior. Nevertheless, the whole is enveloped by thick masonry walls that betray little of the lightness inside. Nor, it seems, have the masons taken advantage of the skeleton of ribbing to reduce the mass of the vault.

The system of vaulting employed here may not be related directly to the developments in ecclesiastical architecture but to the developments in monastic architecture. Peter Fergusson has made the compelling argument that the Cenacle served as the model for certain refectories of the Augustinian order in the British Isles.¹⁵ In Jerusalem, the Austin Canons were responsible for Sion and the Cenacle, and this important charge provides both the means and the motivation behind the transmission of forms. The association emphasized the symbolic relationship of the gathering of the monks for common meals with the gathering of the apostles for the Last Supper. This might explain the upstairs location of some monastic refectories, as at Easby Abbey, but these spaces were usually unvaulted. On the other hand, there were also—prior to the construction of the Cenacle—other monastic spaces that were two bays wide, covered by ribbed groin vaults used in series, as, for example, chapterhouses. The Cistercian chapterhouses at Fonte-



Fig. 5.2. Jerusalem, Cenacle, view of ribbed vaulting, before 1187. Photo: author.

may and Senanque offer useful comparisons that look suspiciously like the Cenacle.¹⁶ We might suggest that the gathering of monks at chapter could be compared with the gathering of the apostles at Pentecost in the Cenacle. In fact, this may have been a two-way symbolic relationship—that is, the Cenacle, with its monastic associations, was modeled after familiar monastic spaces, incorporating the type of vault construction associated with them. Subsequently, the new form of the Cenacle exerted an influence on the layout of monasteries, as Fergusson proposes, but without a transfer of technology. The upper-level setting was replicated but the vaulting was not. As with the crusader Holy Sepulchre, the transfer of ideas from the West to the Holy Land involved elements of both architectural planning and technology, while the transfer from the Holy Land to the West was on a symbolic level, involving only a generalized replication of significant architectural forms.¹⁷

A second example of the early ribbed groin vault, the Cathedral of St. John at Sebaste, is now in a ruined state, but various scholars have attempted to reconstruct it with the nave covered by sexpartite vaults above an alternating support

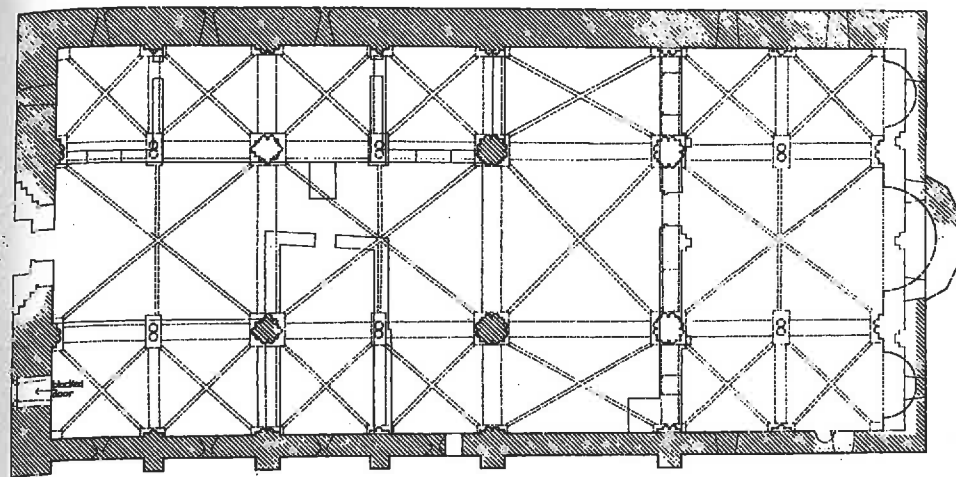


Fig. 5.3. Sebaste, Cathedral of St. John, plan, mid-twelfth century. After Pringle.

system (fig. 5.3).¹⁸ This system of vaulting, common in late-twelfth-century France, would have been virtually unique in crusader architecture, but it seems entirely plausible, based on the surviving evidence of the piers and capitals. Nurith Kenaan-Kedar has attempted to connect the appearance of the sexpartite vaults here with the well-documented patronage and support from France, including that of William of Sens in the 1170s.¹⁹ The nave of the Cathedral of Sens, of course, is one of the great early examples of the sexpartite Gothic vault.²⁰

I believe the issue is a bit more complex and should be reevaluated, for the plans of the two buildings are not at all alike. In fact, their *only* similarity is, possibly, the form of the vault. As I suggested earlier, patrons of churches might be familiar with the liturgical organization of space—and one might expect this to be one of their major concerns—but they rarely arrive on the scene with a sophisticated knowledge of engineering. With the exception of the sexpartite vaulting and the alternating support system with doubled columns, the planning and construction details do not correspond. Importantly, with the exception of the Holy Sepulchre, crusader churches in the Holy Land never replicate the French chevet but favor a simple three-apsed termination instead.

Let us now turn to some different, if related, problems and move gradually to architectural developments of the thirteenth century. Ribbed vaulting appears in several spaces of the Compound of the Knights of St. John at Acre, from the end of the twelfth century.²¹ In the latrine, however, the ribs have fallen, with the ex-



Fig. 5.4. Acre, Compound of the Knights of St. John, vault of latrine, showing springer and exposed arris where rib has fallen, end of twelfth century. Photo: author.

ception of surviving corbelled springers, still bonded in the corners of the room. Above this level, the vaults have smooth arrises, and there is virtually no trace left of the missing ribs (fig. 5.4). Without the bonded springers, it would have been virtually impossible to tell that the vault was ribbed. In the nearby Hall of the Knights, identical ribbed groin vaults were employed, rising from their bonded springers on heavy cylindrical piers. A close examination of the vaults similarly indicated that the ribs were *not* bonded to the webs. In several places, the ribs have fallen, but the vault has remained intact (fig. 5.5). This indicates that in terms of structure, the ribs and the vault proper functioned separately, and that the ribs were not providing any structural reinforcement for the vaults.

The distinction between the rib and the web of the vault is significant, for in French Gothic architecture the two functioned as a unit, either bonded together during construction or with the rib securely attached to the vault with mortar.²² Moreover, if the vault was damaged and suffered partial collapse, it was normally the web that fell and not the rib. This is evident in the ruined church at Ourscamp



Fig. 5.5. Acre, Compound of the Knights of St. John, view of hall, showing springing of ribbed vaults, end of twelfth century. Photo: author.

in Oise, where the ribs are heavy and deep in section; they have remained in place long after the vault deteriorated.²³ Photographs of the collegiate church of St.-Quentin (c. 1220–57) and of Cologne Cathedral (c. 1270–1320) taken after bombardment in World War I show that the skeletal system of the ribs often withstood devastation when other parts of the vaults fell.²⁴ In examples where the ribs fell during the bombardment, it was normally the result of severe destruction in a building with fairly sophisticated ashlar construction of the vault webs. In the French examples, the ribs allowed for the construction of thin vaults, and, as Robert Mark has demonstrated, under normal circumstances the ribs were unnecessary once the mortar had set.²⁵ Nevertheless, they provided additional stability during crisis situations, such as earthquakes, high winds, and aerial bombardments. In contrast, the crusader vaults are considerably more massive, retaining their heavy character in spite of the added ribs.

Several explanations can be put forward for the distinction. Crusader architecture might have relied on massiveness as part of its symbolic expression—that is, part of a language of power, similar to the massiveness of Anglo-Norman architecture at the turn of the twelfth century. The heavy character might also be related to the threat of seismic activity in the region. But it may just as well have been the result of a general conservatism in crusader architecture. One possible

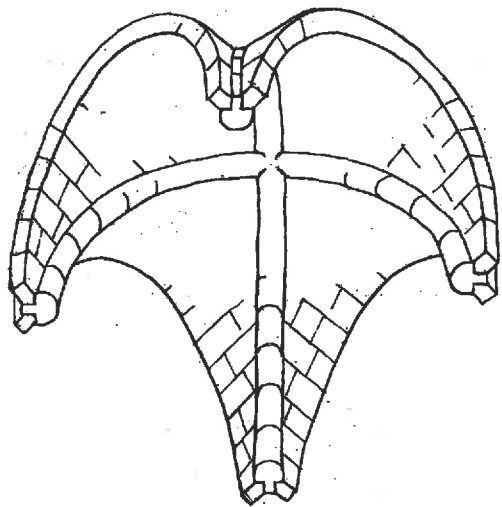


Fig. 5.6. Diagram of a ribbed groin vault showing construction with rib stem and rebated shelves. Drawing: author.

reason for the separate construction of the ribs in crusader vaults is that their primary function was *constructional*—that is, they acted as formwork to brace and shape the vault during its construction and to help to support its weight until the mortar had set. A similar interpretation has been proposed for the use of ribs in French Gothic architecture, in spite of their difference in thickness.²⁶ Although the crusader ribs may have served functions identical to their French counterparts during the process of construction, structurally they behaved differently afterward. In the French examples, once completed the ribs acted in combination with the vault. In many twelfth-century examples, the ribs were constructed with a rib stem flanked by rebated shelves on the backside, into which the webs were bonded (fig. 5.6).²⁷ The webs of the vault were thus connected directly to the ribs, but in fact, the ribs also separated the webs one from another. This type of vault construction appeared in the side aisle vaults at St.-Etienne at Beauvais, for example.²⁸ It also may be seen in the high vaults of the Holy Sepulchre (fig. 5.7).²⁹ This detail, visible in the extrados during recent repairs, would have been invisible in the completed building, a fact that emphasizes the technical indebtedness of the Holy Sepulchre's vaulting to new developments from France. I have not observed this detail in any other crusader building. In French Gothic architecture, the system of rib stems and rebated shelves was rarely used for the diagonals in rectangular vaults, and the system seems to have been gradually abandoned with the greater technical mas-



Fig. 5.7. Jerusalem, Holy Sepulchre, extrados of transept vault during repair, showing rib stems between vault compartments. Photo: Virgilio Corbo.

tery of vault construction in the thirteenth century. Nevertheless, either the greater stress or perhaps the strength of the mortar served effectively to unify the ribs and the vault. In contrast, the ribs of the crusader vaults at Acre appear neither rigid nor firmly attached. They could fall off without compromising the integrity of the vault, the stability of which was provided by its massiveness.

We see much the same sort of thing in a variety of thirteenth-century vaults. At Montfort Castle, constructed between c. 1226 and 1240, the hall of the guesthouse was covered by quadripartite ribbed groin vaults, but the ribs have fallen in the east bays.³⁰ Although the diagonal ribs of square bays could easily have been constructed with penetrating stems, Denys Pringle has noted the lack of bonding in the ribs, with smooth arrises at the groins. Similarly, in the east gate at Caesarea, completed by 1252, the ribs appear to be separate from the vault.³¹ Several stones of the ribs seem to have been restored, apparently without disturbing the vault behind them. And, in the Grotto of the Annunciation at Nazareth, the seventeenth-century illustration by Cornelius de Bruyn shows the elegant, triple-moldings of the Gothic ribbed vaults (fig. 5.8).³² It appears that several of the ribs have fallen, and the artist has depicted the setting of the ribs on the arrises (and not the ribs themselves), above the surviving *tas-de-charges*. Again, the ribs have fallen, the vault has not. In fact, without understanding this phenomenon, the

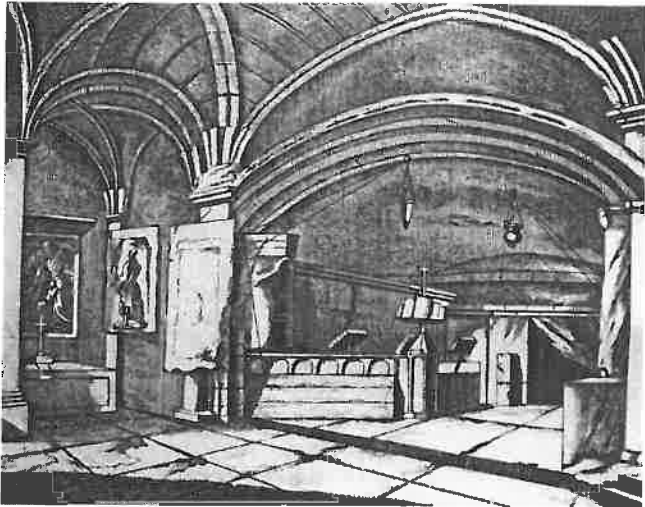


Fig. 5.8. Cornelius de Bruyn, seventeenth-century drawing of the Grotto of the Annunciation, showing *tas-de-charges* and exposed arrises where ribs have fallen

vaulting in de Bruyn's illustration would make no sense at all. This lack of bonding characterizes later architecture on Cyprus as well, as, for example, in a hall at Famagusta.³³ The same is seen in the vaults of the refectory at Crac des Chevaliers, from the mid-thirteenth century.³⁴ Here the windows of the portico have elegant bar tracery, and the groin vaults have thin, profiled ribs (figs. 5.9 and 5.10). But, like the vaults at Acre, some of the ribs have fallen, and it is clear they were not bonded.

Can the ribbed groin vault serve as a cultural signifier for crusader architecture? I think it can, if properly read, and here I recall the principles set out at the beginning. In fact, the refectory at Crac des Chevaliers provides a very instructive disjunction between architectural style and construction technology. The ribs and the tracery are elements of style, but in other aspects the actual vault construction has more in common with the traditional architecture of the Middle East than with the Gothic architecture of western Europe.

From the eleventh century on, the standard vault form used in the Middle East area was a rather heavy, unribbed groin vault, built above slightly pointed arches. Normally, the arches and the springers framing the vault were of ashlar construction, but the vault itself was more irregular, often of mortared rubble. This type of vault was used in precrusader architecture, as, for example, at the mid-eleventh-century Monastery of the Cross, outside Jerusalem (fig. 5.11).³⁵ During the cru-



Fig. 5.9. Crac des Chevaliers, refectory façade, showing Gothic tracery, mid-thirteenth century. Photo: author.

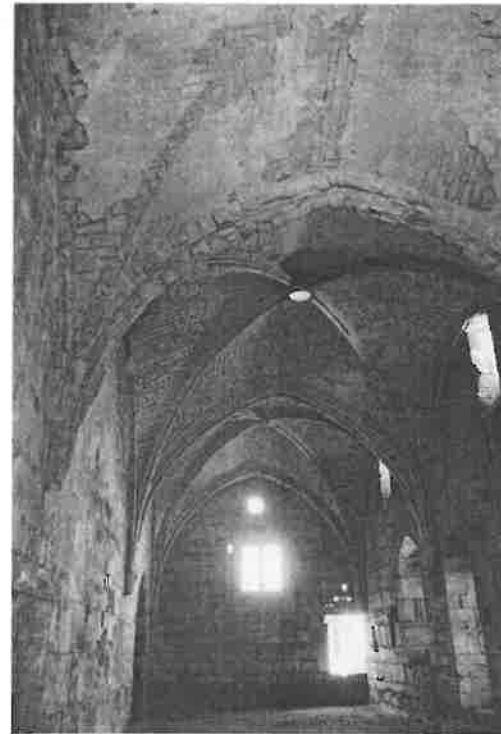


Fig. 5.10. Crac des Chevaliers, interior of refectory, showing ribbed vaults, mid-thirteenth century. Photo: author.

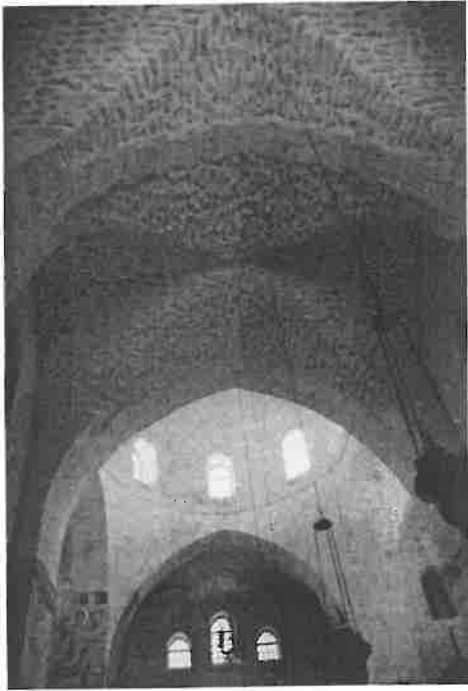


Fig. 5.11. Jerusalem, Monastery of the Cross, interior of katholikon, showing groin vaulting, mid-eleventh century. Photo: author.

sader period, it appears frequently, as, for example, at Crac des Chevaliers and Acre (fig. 5.12).³⁶ We still find variations of this type of vault used during the Mamluk period, as in the Suq el-Qattanin in Jerusalem, with a rough vault rising above neat ashlar quoins at the springing.³⁷ Out of context, these vaults are almost impossible to date. In parts of the Church of the Holy Sepulchre, for example, it is impossible to tell the eleventh-century Byzantine vaulting from the twelfth-century crusader construction.³⁸ All of this points to a well-developed local tradition of construction—one capable of withstanding dramatic changes of rulership and patronage.

The crusader ribbed vaults, just discussed, fit into this picture. Except for the ribs, the vaults are for the most part typical regional creations. We might compare the bonding of the corbelled springers with the ashlar springers at the corners of the unribbed vaults. Both serve to define the shape of the vault. Here we may be witnessing a continuation of local construction practices, onto which the signature elements of French Gothic style have been superimposed. With rare excep-

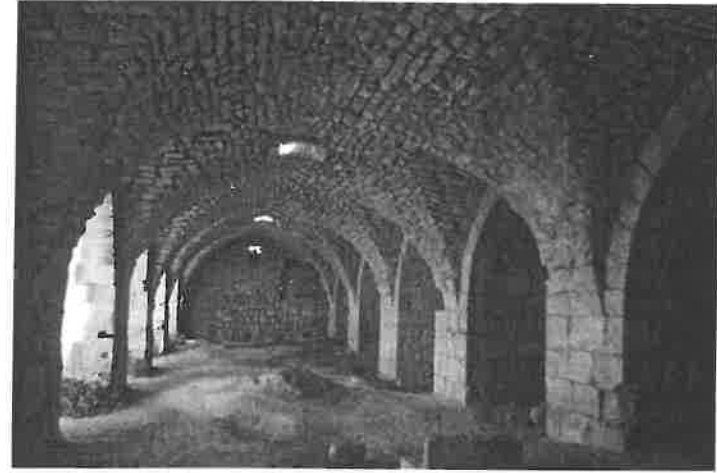


Fig. 5.12. Crac des Chevaliers, vaulting of undercroft. Photo: author.

tion, the construction is heavy and massive for both walls and vaults, and the windows remain small. Crusader buildings still appear massive, even when light, skeletal elements of the Gothic are introduced. Vaults are nevertheless roughly built, even above carefully profiled ribs. The result is, in effect, a bilingual building. The construction technique speaks of the regional tradition of the masons; in contrast, the ribs and tracery articulate the language of the patron.

Obviously, there must have been European-trained artisans involved in these projects as well, as masons' marks suggest.³⁹ Trained artisans were necessary for the transfer of tracery patterns and the rib profiles. But the bulk of the labor force must have been local, and the defining characteristics of the building remain indigenous. In French Gothic architecture, the ribs and tracery are integral to the design and structure of the building. By contrast, in the crusader monuments, they form a stylistic overlay, and they can fall off without damaging the structure.

What I conclude from this brief analysis is that continuity in crusader architecture was provided to a large extent by an indigenous workforce. The contacts with the architectural currents of western Europe were neither uniform nor continuous. They were never fully integrated into crusader architecture, and they had little lasting effect on its overall development. Ribbed groin vaults disappeared from the scene with the departure of the crusaders, although other aspects of vault construction continued in the region. Gothic details provided certain specific cultural associations at particular points in time that would have had special meanings to a Eurocentric clientele. Although these sporadic infusions of the Gothic

may have affected the outward appearance of buildings, they did not dramatically alter the development of an architecture that remained primarily a regional architecture.

When crusader architecture is discussed in detail, if it is discussed at all, it is usually placed into a provincial French context.⁴⁰ Indeed, the stylistic development of crusader architecture would make no sense at all without periodic French connections. But to get at the essence of the crusader building program, the distinctions set out at the beginning of this essay are worth bearing in mind. Style and construction technique often have different points of origin; and architecture is built by masons, not patrons. This means that the building fabric may tell a very different story than the surviving historical documents. It is standard practice in current art historical studies to privilege the text, and this often results in the writing of art history as the history of patronage.⁴¹ Such studies certainly have their merit, but at the same time, we should also be able to read a building as if it were a historical document—and with the level of nuance we have seen in current manuscript studies. For the architectural historian, the monuments may be the most instructive texts of all. Clearly, we still have much to learn from crusader architecture.

Notes

1. See my *Master Builders of Byzantium* (Princeton, 1999). This chapter originated as a paper presented at the symposium "Frankish Culture at the End of the Crusades: France and the Holy Land," held at the Johns Hopkins University in March 2000. I thank Dan Weiss and Anne Derbes for their encouragement.
2. Michael Davis, "Masons and Architects as Travelers," in *Trade, Travel, and Exploration in the Middle Ages*, ed. John B. Friedman and Kristen Mossler Figg (New York, 2000), 380–82.
3. John Fitchen, *The Construction of Gothic Cathedrals* (Chicago, 1961), 42–85; and James H. Ackland, *Medieval Structure: The Gothic Vault* (Toronto, 1972), 71–89, both give good explanations, perhaps overemphasizing the structural aspects of the ribbed groin vault.
4. See Fitchen, *Construction*, 86–173, for a detailed analysis.
5. As occurs at San Ambrogio in Milan; see Ackland, *Medieval Structure*, 76.
6. As occurs at Speyer Cathedral; *ibid.*, 176.
7. As occurs at St.-Philibert in Tournus and at la Madeleine in Vezelay; *ibid.*, 45, 81.
8. As occurs at Durham Cathedral; *ibid.*, 83.
9. As emphasized by Robert Mark, *Experiments in Gothic Structure* (Cambridge, Mass., 1982), 115.
10. Jaroslav Folda, *The Art of the Crusaders in the Holy Land, 1098–1187* (New York, 1995), 302, with additional bibliography.

11. Virgilio Corbo, *Il Santo Sepolcro di Gerusalemme: aspetti archeologici dalle origini al periodo crociato*, 3 vols. (Jerusalem, 1981–82), 205–7; Folda, *Art of the Crusaders*, 178, who gives the best assessment of the construction history of the crusader phase, places the bulk of the work in the 1140–49 period. The contemporary sources remain curiously silent about the rebuilding of the Holy Sepulchre, and even the patronage goes unmentioned.

12. See Folda, *Art of the Crusaders*, 175–245; and Robert Ousterhout, "Architecture as Relic and the Construction of Sanctity: The Stones of the Holy Sepulchre," *Journal of the Society of Architectural Historians* 62 (2003): 4–23.

13. See Marcel Aubert, "Les plus anciennes croisées d'ogives: leur rôle dans la construction," *Bulletin Monumental* 93 (1934): 5–67, 137–237, for the early development of ribbed vaulting in France.

14. Hugh Plommer, "The Cenacle on Mount Sion," in *Crusader Art in the Twelfth Century*, BAR International Series 152, ed. Jaroslav Folda (Oxford, 1982), 139–66.

15. Peter Fergusson, "The Refectory at Easby Abbey: Form and Iconography," *Art Bulletin* 71 (1989): 334–51.

16. For illustrations, see M.-Anselme Dimier and Jean Porcher, *L'art cistercien* (Zodiaque, 1962), figs. 8, 41.

17. As with the numerous medieval "copies" of the Holy Sepulchre; see Richard Krautheimer, "Introduction to an 'Iconography of Medieval Architecture,'" *Studies in Early Christian, Medieval, and Renaissance Architecture* (New York, 1969), 115–50.

18. Denys Pringle, *The Churches of the Crusader Kingdom of Jerusalem: A Corpus*, vol. II (Cambridge, 1993), 283–97.

19. Nurith Kenaan-Kedar, "The Cathedral of Sebaste: Its Western Donors and Models," in *The Horns of Hattin*, ed. Benjamin Z. Kedar (Jerusalem, 1992), 99–120; Folda, *Art of the Crusaders*, 309–11.

20. Jacques Henriot, "La Cathédrale Saint-Etienne de Sens: le parti du premier maître, et les campagnes du XIII^e siècle," *Bulletin Monumental* 140 (1982): 6–168.

21. Wolfgang Müller-Wiener, *Castles of the Crusaders* (London, 1966), 72–74, 102, and fig. 100.

22. Aubert, "Anciennes croisées," esp. 139–45; Fitchen, *Construction of Gothic Cathedrals*, 69–71.

23. Aubert, "Anciennes croisées," 215.

24. *Ibid.*, 221.

25. Mark, *Experiments in Gothic Structure*, 102–17.

26. *Ibid.*

27. Aubert, "Anciennes croisées," 139–41; Fitchen, *Construction of Gothic Cathedrals*, 69–71.

28. J. David McGee, "The 'Early Vaults' of Saint-Etienne at Beauvais," *Journal of the Society of Architectural Historians* 45 (1986): 20–31, whose date "as early as the 1070s" may be too early.

29. Corbo, *Il Santo Sepolcro*, III, pls. 174–76.

30. Pringle, *Secular Buildings in the Crusader Kingdom of Jerusalem: An Archaeological Gazetteer* (Cambridge, 1997), 73-75; fig. 39 and pl. LXXV.
31. *Ibid.*, 43-45, and pl. XXXV.
32. Folda, *The Nazareth Capitals and the Crusader Shrine of the Annunciation* (University Park, 1986), pl. 50.
33. Müller-Wiener, *Castles*, 88-90, 105, and fig. 141.
34. *Ibid.*, 59-62, 100-101.
35. Pringle, "Church-Building in Palestine before the Crusades," in *Crusader Art of the Twelfth Century*, 10 and pls 1.7a-b.
36. Müller-Wiener, *Castles*, 59-62, 72-74.
37. Michael Burgoyne, *Mamluk Jerusalem: An Architectural Study* (London, 1987), 273-98.
38. As I have noted elsewhere: "Rebuilding the Temple: Constantine Monomachus and the Holy Sepulchre," *Journal of the Society of Architectural Historians* 48 (1989): 66-78; also Corbo, *Il Santo Sepolcro*, III, figs. 163, 165, for illustrations.
39. Pringle, "Some Approaches to the Study of Crusader Mason's Marks in Palestine," *Levant* 13 (1981): 173-99.
40. As, for example, the classic study of Camille Enlart, *Les monuments de croisés dans la royaume de Jérusalem: architecture religieuse et civile*, 2 vols. (Paris, 1925-28).
41. As, for example, Folda, *Art of the Crusaders*.

PART III

ACRE

AS A CULTURAL CENTER

