

# TIMBER FRAMING

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*The Riddle of Tremblay*

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IN 2002, the Philadelphia Museum of Art was about to relocate the contents of a storage facility, among them a 6-ft. stack of timbers 5 ft. wide and 60 ft. long, as well as crates of small pieces (1), all supposedly representing a late medieval French refectory ceiling called Tremblay, and acquired by the institution in 1941. With the exception of a few accompanying contemporary letters, records were absent. Dean Walker, Curator of European Art at the Philadelphia Museum, asked us to decipher the timbers.

In 1928, George Grey Barnard, who had discovered and disassembled the relic in France, sought the interest of the legendary architectural historian Fiske Kimball, then the museum's director. Barnard's descriptions were frustratingly elastic. His letter to Kimball of 5 October 1928 said "the room is 160 feet long and about 45 feet in width." Eight days later he repeated the length at about 160 ft. but now reported the width "at some 25 feet." Fifty years later, the museum commissioned an investigation of the ruinous foundations of a structure at Tremblay-lès-Gonesse on the northern outskirts of Paris, which found a width of 9m, about 29 ft. Clearly none of these dimensions could be trusted as definitive.

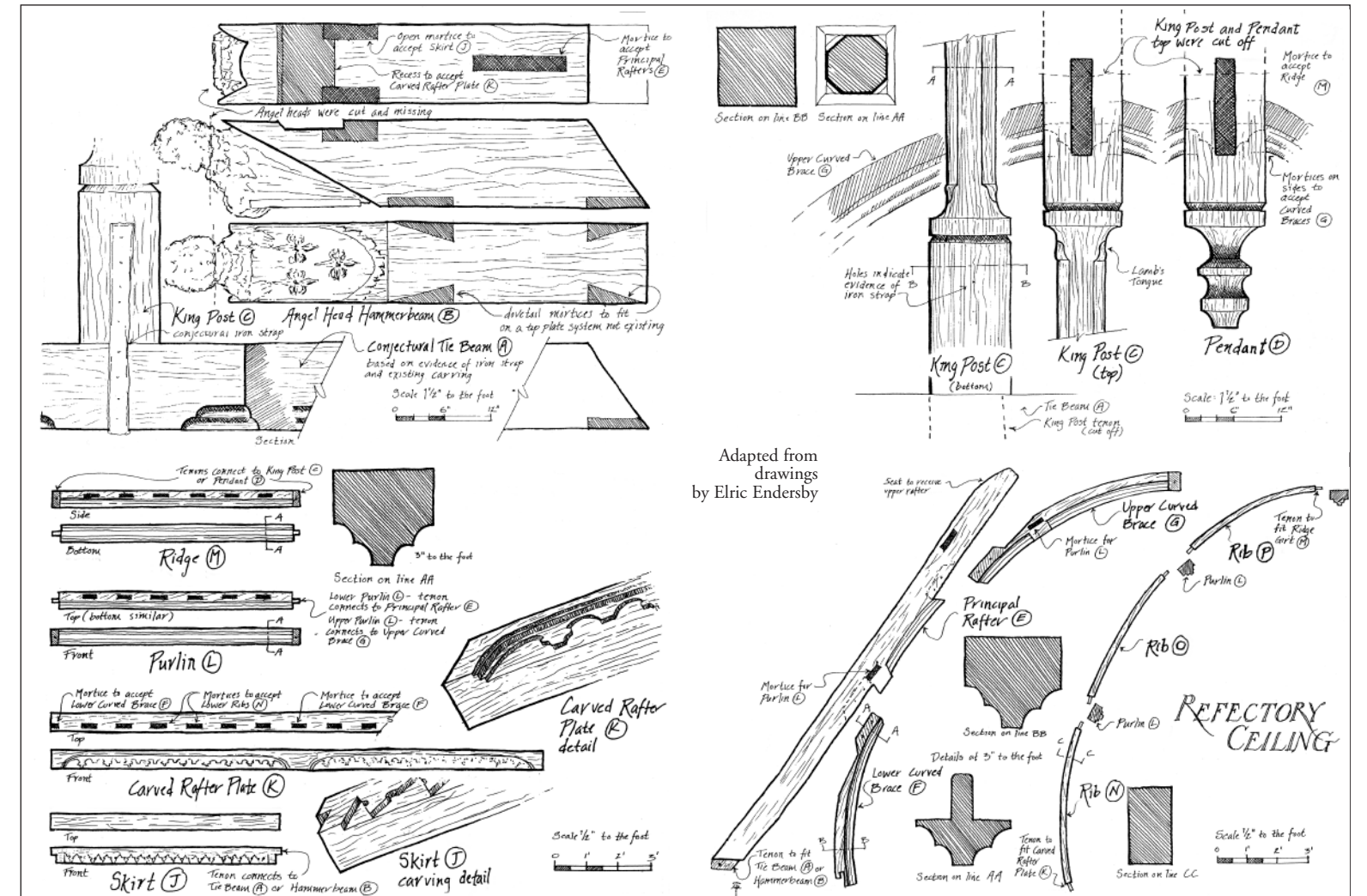
No photographs or drawings survived. Some of the hundreds of individual members bore framer's marriage marks dating to the 15th century (2); some bore stenciled identifications for shipment across the Atlantic five centuries later. But there were no coded plans. A scale model apparently accompanied the frame when it was acquired but it, too, was lost.

Descriptive accounts offered a few clues. Barnard had written Kimball, "I purchased an old Abbey in order to obtain a superb Gothic roof of oak arched and carved . . . [an] oak beam support runs along the walls of the Ancient dining room and support[s] the

arches of oak. They are not the cross beams, these cross beams are separate . . . Many large carved heads support the upright beams in the center of these arches." A 1941 museum catalogue of the acquisition described the disassembled structure as "consisting of 64 arches, 80 cross beams, 9 columns and 9 corbels. The latter show the carved angels holding shields with alternating designs: three roses and three bishop's mitres."

So we began with more questions than answers. If the true character of the structure was to be revealed, the timbers themselves would have to tell the tale. Our approach was to seek out one or two examples of each member to understand how they might be assembled.

The timbers fell into several distinct categories. The most conspicuously decorated were short, carved pieces we came to call hammerbeams (B in the drawings on the facing page), after similar unbraced members in Outwell Church, Norfolk, so called and shown in Raphael and Arthur Brandon's *Open Timber Roofs of the Middle Ages*. Measuring about 4 ft. 6 in. long and 11 in. square, the hammerbeams were embellished at one end with winged angels, all but one of whose faces (3) had been hacked off, possibly during the French Revolution. The angels clutched shields adorned not just with mitres and roses but a number of different heraldic emblems (4 and back cover). At the opposite end, the hammerbeams were angled back bottom to top by 7½ in., suggesting a roof pitch of 7½ by 11. The bottom surface was fashioned with two shallow lap dovetails at each end. The upper surface near the angel carving was relieved to receive a passing timber (K in the drawings), while an 11½-in.-long mortise was chiseled at the other end to accept a major rising timber, likely a principal rafter.



Adapted from drawings by Eric Endersby

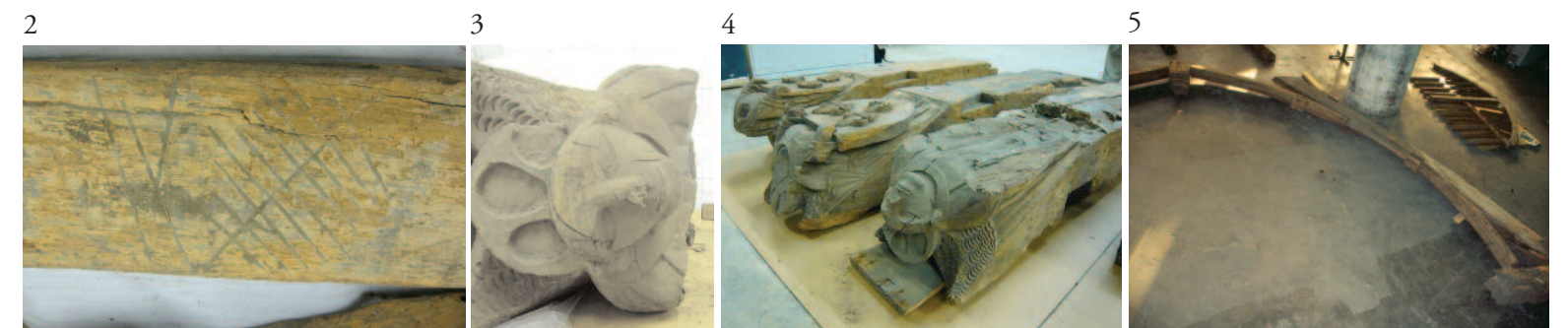
A separate group comprised two sorts of probably related timbers. One, apparently kingposts (C), measured 12 ft. 9 in. long, with central chamfered sections of 9 ft. 6 in. The other sort, apparently pendants (D), were about 2 ft. long and terminated in remarkably various carved square turnings (see cover photo). Both sorts of timbers were about 10 in. square in section and, with one exception, displayed 7-in. open mortises on all four sides. All of these members, short and long alike, appeared to have been cut at or just inside these mortises.

A third set of timbers seemed likely to be horizontal elements. There were four distinct but related types (J, K, L and M), of which J, L and M were approximately 7 ft., 5 in. in length.

Timbers type (K) were 15 ft. 10½ in. long, with major mortises at the center and on each side a series of six evenly spaced mortises on the upper surface. The same evenly spaced mortises occurred on both the upper and lower surfaces of the L and M timbers. The tenons at the ends of the L timbers were oriented vertically; on the M timbers they were horizontal. The remaining horizontal type (J) was more highly decorated, had no mortises and terminated in half-laps at both ends in place of tenons.

A final series of structural members were arched over all or part of their length. The vast majority of these took the form of slender ribs in three slightly different lengths (N, O and P). Of the remaining members (E, F and G), it became evident that together these formed arched bents, the principal support for the ceiling. Although different in length, F and G were fashioned with the same molded profile as on the horizontal members L and M and were acutely angled at one end with long blade-like tenons. In sorting through the entire stack of timbers, we discovered only two examples of a particular beam into which these timbers would fit. That single pair of principal rafters (E) displayed the same molded profile as the curved braces (F and G) but over only 3 ft. of their much greater length. Still, when joined together with the other arched and molded timbers, they formed the two sides of a Gothic arch (5).

Fitting together these arched timbers was just the beginning of the assembly process. The next step was to find a companion member to receive the tenons at the top of each of these half-arches. Eventually we recognized that the tenons could be fit into either C or D, the former a boss or pendant, the latter a kingpost.



With the pendant in place as the central uppermost member and an angel-head “hammerbeam” neatly fit at the bottom on each side, we were finally able to make a full assembly.

The alternative composition, using the kingpost in place of the pendant, was more challenging. The base of each kingpost originally terminated in a central tenon (on the remaining evidence a wedged half-dovetail) cut off during disassembly (6). And we had no tie beams to span the distance between the rafter feet and to join the kingpost at midspan. Despite the mention of “80 cross beams” in the museum inventory of 1941, none of these crucial members, evidently the “crossbeams” mentioned by Barnard, had accompanied the accession.

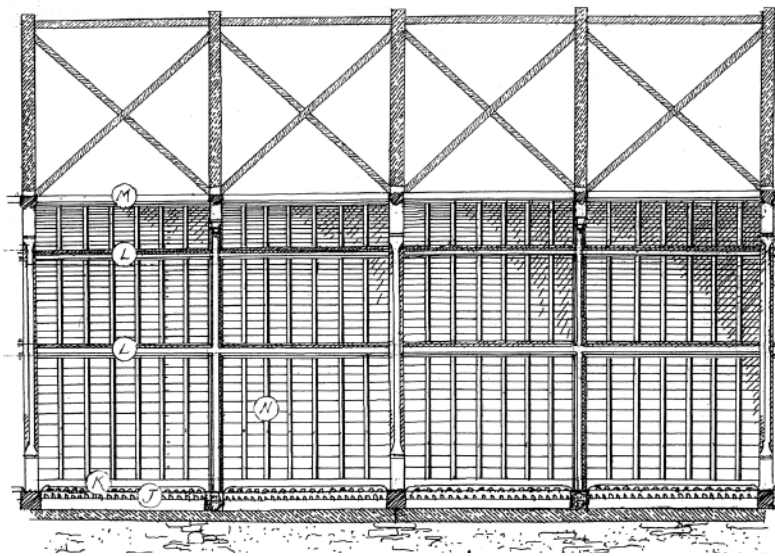
Judging by the lap dovetails cut into the bottom surface of the so-called hammerbeams, they (along with the missing tie beams) were originally located longitudinally by a double set of 8-in.-wide horizontal members aligned respectively with the inside and outside of masonry sidewalls. The distance between the outer extremities of the mortises established the thickness of the walls at approximately 2 ft. 8 in.

To ensure the structural integrity of the roof, the pendant and kingpost assemblies almost certainly alternated. The cadence of these roof frames can be surmised from the horizontal timbers that connected them, indicating the interval as 8 ft. on center. The ridge pieces (*M* in the drawings this and facing pages), with vertical tenons, connected kingposts and pendants. The purlins (*L*), with horizontal tenons, connected the arched rafters and, spaced about 5 ft. apart, essentially divided each side of the arch into thirds.

The 16-ft. decoratively carved members were plates (*K*) running over the tiebeams and hammerbeams and in turn supporting the lower arched braces (*F*) and the lowest rank of ribs (*N*). Barnard mentioned these elements in noting “The carved oak beam support runs along the walls of the Ancient dining room and support[s] the archers of oak.” Pleasingly incised with a sawtooth design, the final horizontal element (*J*) formed a decorative band let into the upper sides of the alternating hammerbeams and ties (*7*).

Very little came to us of the upper roof system originally hidden above the vaulted ceiling. Of the two principal rafters that we did have, one terminated in a half-scarf joint with a peg hole. Among the odd unembellished timbers not previously assigned, we discovered several straight members (*H*) measuring 3x4 in. and about 8 ft. long. The lower joint in each case matched the scarf and the upper had an angled tenon that would align with the uppermost extremity of the kingposts and pendants had they not been cut short. Angled mortises in these same timbers implied diagonal struts (*I*), also tied to hidden upper kingposts and the posts that terminated in pendants.

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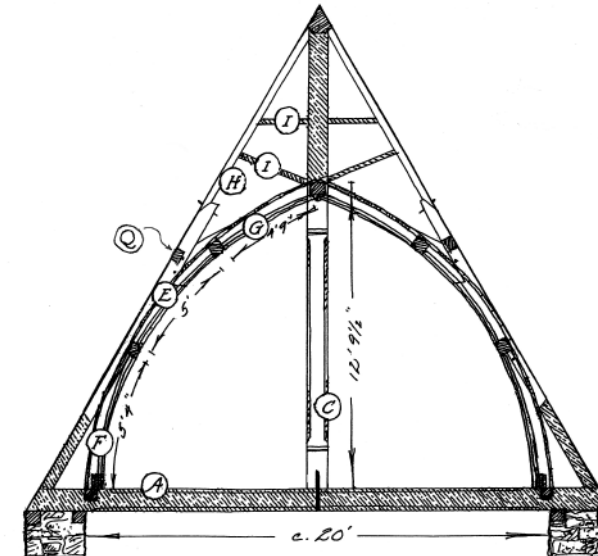
The hidden outer roof system probably demanded longitudinal components for which no evidence survives. There are 11½-in. long mortises near the original mid-point of the total rafter length in the roof plane (*Q*), which establish where purlins once connected the roof frames. A lower rank of hidden common rafters might have spanned the distance from the plates to these purlins, while a corresponding upper rank would have risen from the purlins to the ridge.

Why did so little of the outer frame come down to us? Among the timbers we examined, there were no plates or purlins from the outer roof. Given the length of the building, there would have been many principal rafters and many more common rafters in the outer roof framing. Only the few 3x4x8 members, apparently principal rafter extensions, were included in the stack.

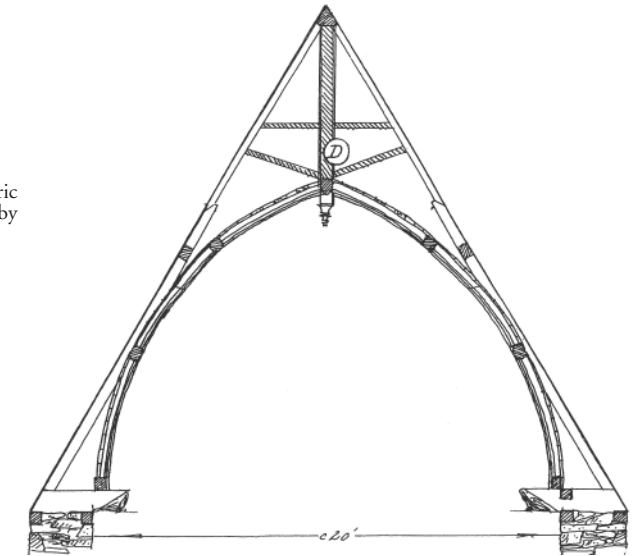
This absence was partially explained by a late discovery in our investigations. A previously overlooked crate contained dozens of 3-ft. remnants, each slightly curved and molded like the *E*, *F* and *G* sections of the vault. The opposite surface of each of these pieces had obviously been roughsawn from larger original timbers. It was one of the great moments in our investigation when we established that these were the surviving decorative faces of 29 absent principal rafters. (In theory, there would have been 42 in the original frame.)

The explanation for both the missing and mutilated timbers was in fact offered by Barnard himself in his first letter: “It was necessary to buy the whole building to obtain the roof and yet we must replace it with a new roof, as a fine Chateau of the Sixteenth Century has been built entirely around the Monastic dining

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Drawings Elric Endersby



room.” The apparent method of extracting the “Gothic Roof” was to separate the decorative ceiling from the concealed outer roof structure. By this clever maneuver it was unnecessary to build a new roof over the transformed chateau at no small expense. Rather, all but two of the 42 principal rafters were left in place at Tremblay, although their decorative faces, or most of them, were cut away as part of the package. Likewise the tie beams had to be left *in situ* as they were the essential element holding together the refectory side walls.

In his second letter to Kimball, dated 18 October 1928, Barnard wrote: “This Gothic Roof . . . I discovered in September by the merest chance. . . . When I saw this old chateau was built around an old monastery I investigated naturally in the garret and there came upon this extraordinary Gothic roof which I bought.” The term garret suggests that an attic had been created in converting the monastery to domestic use—that the entire vaulted space had been closed off by the introduction of a new floor at the level of the tie beams. The thrill of his discovery, particularly of the hammerbeams, which would have lain face down below the floor level in this space, can be surmised from his earlier letter: “No one knew of the interest or beauty of this roof until I personally dug out plaster and brick that had enclosed the sculpted portions and realized its value.”

Barnard’s extraction method (or more likely that of his contractor) was ingenious. By selectively severing some of the tenons and bracing the remaining timbers, the workers were able to leave the exterior roof structure above the subsequent chateau ceiling below. How then were the old timbers actually taken out of the building? Included in the stack we found a group of timbers not integral to the ceiling but sharing its character. Once reassembled, these timbers constituted an arched, louvered window frame measuring 9 ft. across and just over 5 ft. high at its peak (see photo X). The removal of this frame from a gable end of the building would have afforded the requisite means of egress.

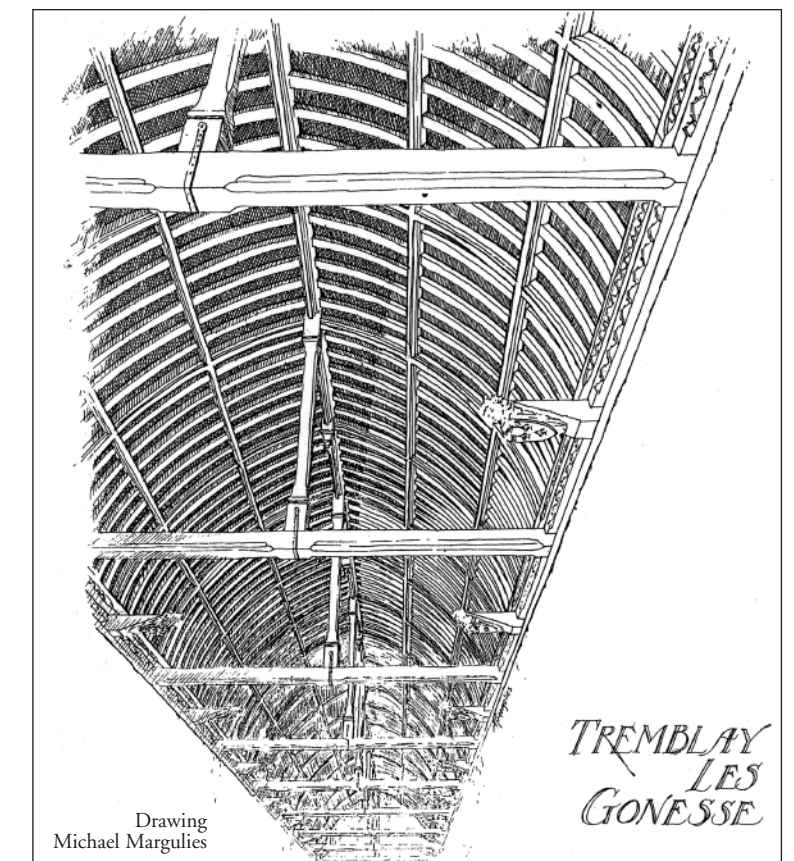
Assembly of the single principal rafter set with its curved braces allowed us to determine that the interior width of the building was just 20 ft.—remarkably narrow for such a long building, but not uncommon in timber frame truss construction of the period, as we learned by consulting the exceptional work by Patrick Hoffsummer et al., *Les Charpentes du XIe au XIXe siècle* (Monum, Paris 2002), which helped us substantially in proposing a likely configuration for the outer roof frame as shown in the sections above.

With the thickness of the outer walls determined at 2 ft. 8 in., the outside width of the structure was just over 25 ft., concurring with Barnard’s second measurement. The height of the stone walls could not be determined, but the height of the roof structure from the bottom of the tie beams to the peak of the outer roof would work out just short of 20 ft.

Barnard twice averred the length of the ceiling to be 160 ft. As this dimension coincided with a cadence of 8-ft. bays, we felt relatively confident in embracing this measure. At that length, the refectory would have required 10 pendant assemblies subdividing the bays formed by nine kingpost trusses. If this was the case, all the kingposts survive, none of the tie beams and just nine of 10 pendants and seven of 20 hammerbeams. For the entire vaulted ceiling, then, about two-thirds of the timbers survived extraction, shipping abroad and, just lately, a dormancy of some 60 years.

We took great pleasure in attempting to unravel the riddle of the timbers that once formed the Tremblay-lès-Gonesse ceiling. We hope that one day we will have the chance to stand under the recreated ceiling and experience the awe that struck Barnard in that garret long ago.

—ELRIC J. ENDERSBY and ALEXANDER T. GREENWOOD  
Elric Endersby and Alexander Greenwood operate The New Jersey Barn Company ([njbarncompany@aol.com](mailto:njbarncompany@aol.com)) in Princeton, New Jersey.



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