SHORT COMMUNICATION: EXPLORING PROCESS AND DESIGN FOR VISUALLY UNOBTRUSIVE OBJECT MOUNTS

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ABSTRACT—The recognition that any exhibited object is vulnerable to the effects of visitors, vibrations, or natural forces, such as earthquakes, has expanded our expectations that a properly designed mount will afford sufficient protection and has placed mountmaking firmly at the forefront of preventative conservation. Today's mountmakers and conservators are challenged to find methods and materials that provide such protection without compromising the visual integrity of objects and the aesthetic appeal of their display. This article provides specific examples of materials, methods, systems, and designed environments that help reduce the visual impact of supportive and protective mounts. Approaches to mountmaking are considered integral components of the design process, with an emphasis on keeping specific structural characteristics of mounts as unobtrusive as possible.

TITRE—Exploration des processus de design pour des supports d'objet visuellement discrets RÉSUMÉ—Le fait de reconnaître que tout objet exposé est vulnérable aux effets des visiteurs, des vibrations ou des forces naturelles, telles que les tremblements de terre, a eu pour effet d'élever au premier rang de la conservation préventive la fabrication de support d'exposition et d'augmenter nos attentes qu'un support bien conçu offrira une protection adéquate. Aujourd'hui, les techniciens et les restaurateurs qui fabriquent des supports ont pour défis de trouver des méthodes et des matériaux qui procurent une telle protection sans compromettre l'intégrité visuelle des objets et l'attrait esthétique de la présentation. Cet article donne des exemples précis de matériaux, de méthodes, de systèmes et de designs qui aident à réduire l'impact visuel des supports d'objets. Les approches employées pour la fabrication de support sont considérées comme faisant partie intégrante du processus de design, s'efforçant de garder la structure du support la plus discrète possible.

TITULO—Explorando el proceso y el diseño de soportes discretos para objetos RESUMEN—El reconocimiento de que cualquier objeto que se exhiba es vulnerable a los efectos de los visitantes, la vibración o las fuerzas naturales como terremotos, ha aumentado nuestra expectativa de que un soporte diseñado en forma apropiada le dará suficiente protección y ha ubicado firmemente la fabricación de soportes a la vanguardia de la conservación preventiva. Hoy día los fabricantes de soportes y los conservadores se encuentran ante el reto de encontrar materiales y métodos que ofrezcan tal protección sin comprometer la integridad visual de los objetos y al atractivo estético de su exhibición. Este articulo ofrece ejemplos concretos de materiales, métodos, sistemas y entornos diseñados que contribuyen a reducir el impacto visual de los soportes que ofrecen apoyo y protección. Las propuestas para la construcción de los soportes se consideran componentes esenciales del proceso de diseño, haciendo énfasis en mantener las características estructurales especificas tan discretas como sea posible.

TÍTULO—Explorando projeto e design para montagens visualmente discretas de objetos RESUMO—A constatação de que qualquer objeto exposto é vulnerável aos efeitos colaterais dos visitantes, das vibrações ou de forças da natureza como terremotos, aumentou nossas esperanças de que uma montagem adequadamente desenhada possibilitará proteção suficiente, tendo colocado claramente a montagem de exposições na vanguarda da conservação preventiva. Hoje em dia, montadores de exposições e conservadores são desafiados a encontrar métodos e materiais capazes de proporcionar tal proteção sem comprometer a integridade visual dos objetos e o apelo estético de sua exibição. Este artigo fornece exemplos específicos de materiais, métodos, sistemas e ambientes projetados, que ajudam a reduzir o impacto visual de montagens que visam apoio e proteção. Indicações do montador são consideradas partes integrantes do processo de design, com ênfase na manutenção das características estruturais da montagem de forma tão discreta quanto possível.

1. INTRODUCTION

Although opinions may differ on the overall design of exhibitions, consensus is easily found on two topics: mounts must safeguard displayed objects against numerous threats and mounts must not be

visible. Certainly, the first priority of an object mount is to protect that object from threats, such as natural disasters or the destructive actions of viewers, but the less visible a mount is, the less distracting it is to a viewer's appreciation of that object, which should be a top priority when designing exhibitions.

In the last 30 years, the J. Paul Getty Museum has dedicated itself to the development of preventative conservation methods that seek to create elegant, unobtrusive, and seismically stable mounts. As members of the antiquities conservation staff, my mountmaking colleagues and I have familiarized ourselves with our department's history of stabilization techniques. Drawing inspiration from these techniques, we have adapted those designs and created new methods of preventative conservation. Although current standards in this field are hard to define, designing mounts that enhance and protect cultural and historic objects with the least amount of visibility has proven a worthy goal for us. This article outlines the following subjects that have proven to be effective in creating object mount systems that are the least visible yet most effective:

- **Advance Work:** Advance research of objects selected for display should be prioritized whenever possible because many mount designs require coordination and processes that must be started well ahead of an installation. Knowledge of characteristics unique to each piece, in concert with the proper time and planning to act on this knowledge, can make the difference in providing discreet mounts.
- **Materials and Methods:** Knowledge of related materials and methods for the manufacture of mounts, from welding steel to casting resins, better allows a mountmaker to take advantage of opportunities unique to specific objects. Not only must these skills and knowledge become more a part of basic mountmaking, but the means to implement them must be available (i.e., workspaces that allow for objects to be safely handled and the tooling and machinery needed to produce mounts).
- **Integration of Mount Manufacture With Conservation and Design:** Working in concert with the needs of conservation and exhibition design, mountmaking can often play multiple roles, providing supportive elements that cater to an object's innate strengths and weaknesses, while integrating with exhibition environments. Mount systems that are designed and built in sync with the development of conservation treatments and exhibition furniture can blend with those objects and furniture with an efficiency that makes them much less noticeable.

2. WORK IN ADVANCE

The outcome of any mount design is affected, if not fully determined, by decisions made early in the exhibition planning process. If those responsible for mount manufacture are included in the earliest stages of planning, they can integrate their needs with the given demands of a display as seamlessly as possible. Numerous methods of concealing mounts can be used with the aid of the exhibition space, its furniture design, and its layout. Although layout decisions can contribute to less visibility with sightline adjustments and object positioning that help hide a mount, incorporating access and structural advantage to pedestals, bases, walls, and floors allows the exhibition environment to play a greater role in securing objects, thus reducing the demand of reduced visibility solely on the mount. As an example, when access is provided beneath or behind display surfaces, mounts can be secured from concealed areas and thus related hardware remains invisible. Naturally, this type of access is not necessarily something that a fabricator or designer might incorporate unless specifically asked, but including mount design in the planning stages makes it a possibility.

3. STRATEGIC MATERIALS AND METHODS

Specific materials and methods can provide numerous advantages in the fabrication of discreet mount supports. A working knowledge of the various properties of different metals, adhesives, and even basic physics can help fuel imaginative and adaptive efforts to customize mounts. If the opportunities unique to each object are mapped out, specific stabilization techniques may be chosen that maximize protection

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Table 1.
Elastic Modulus (Stiffness) Values of the Materials Most Commonly Used in Mountmaking[a]

Material	Elastic modulus, N/m^2
Acrylic	2–4
Aluminum	69
Brass	102–125
Brass (naval)	100
Stainless steel	180
Carbon steel	200

[a] Data are from www.EngineeringToolbox.com.

and minimize a mount's visibility. To realize this, however, one must have the time, space, and equipment necessary to explore and develop new skills and knowledge. Ideally, facilities for mountmaking should provide room for basic art handling and storage and equipment for welding, brazing and machining, computer design, and research.

3.1 MATERIALS

To keep a mount's size to a minimum, its main structural elements should be the stiffest sections of the overall armature. Table 1 provides data regarding the most common structural materials used for mounts and their *modulus of elasticity*. An elastic modulus, or modulus of elasticity, is the mathematical description of an object's or substance's tendency to be temporarily deformed when a force is applied to it. Naturally, the stiffer a mount's main armature is, the less the system as a whole will move or bend under stress, and the safer the object will be.

One can see that steel is typically twice as stiff as brass and eight times as stiff as acrylic. Therefore, steel clearly is preferable for armatures of any extended length because the size of a supportive element can be considerably smaller if made of steel than of either brass or acrylic. Despite the fact that brass and acrylic, the two most popular materials used for mounts, offer an ease of manipulation and a relatively low setup cost, the benefits of strength and economy of material inherent in steel make it a worthy investment for the long term.

When adding supportive elements to the main structure of a mount, priorities often shift to material characteristics other than stiffness. For example, synthetic resins can be used to cast intimate contact surfaces with an object at strategic points, and lightweight materials, such as acrylic and aluminum, can reduce the overall weight of the mount. However, care must be taken when combining different materials, such as brass and steel, which may corrode when placed in contact with each other.

3.2 METHODS

A range of methods, from casting to machining and welding, contribute numerous advantages to making mounts less visible. Use of these methods provides the mountmaker with the greatest ability to make the closest-fitting supports possible. Naturally, mounts with the most intimate contact with objects tend to be the least visible, while also having the greatest amount of surface contact, which typically provides the best stabilization.

Casting mount components with synthetic resin to fit strategic areas of an object often allows for an intimate capture of that area. Most often, the best areas to target are crevasses or hollows in an object's surface that provide a recessed area for casting. The benefits of this design are twofold: the recess typically allows the cast element an edge to grip and provides an area of reduced visibility for the cast element. Because of the nature of such an intimate capture, these types of mounts should usually be made of mechanically interlocking components, which have to be disassembled to be removed.

Machining specific parts for a mount, from pins and sleeves turned on a lathe to oddly shaped brackets fashioned on a mill, also provides numerous advantages for concealing mounts. The ability to custom make mount elements that are not available off the shelf helps those elements stay as sympathetic to an object's natural shape as possible, without sacrificing strength. If mountmakers are fortunate enough to have the chance to design and create custom methods for protecting objects, they must have the means to do so. A basic lathe and mill, whether bench top or floor model, can provide the necessary means to bring those ideas to life. Although, as previously mentioned, the use of steel can minimize the size of the mount while maximizing the strength of key

structural elements, its use inevitably requires the strength of welded joins. Whereas the more common method of brazing uses a soft, easily melted solder to join various pieces of metal together, a welded union fuses steel parts together by coalescence, where the steel parts themselves are melted into each other. This method creates a much stronger join for the finished product but also provides the added advantage of easily withstanding the stresses of further bending if necessary. Mountmakers with the skills and equipment to weld on site can make and adjust joins in numerous ways to achieve a superior fit without compromising strength.

4. REDUCING THE IMPACT OF VISIBLE MOUNTS

Reducing the visible elements of a mount through strategic positioning and the manufacture of custom elements can in many cases render the support nearly invisible. The following section explores methods that modify common mount designs to minimize components that cannot be entirely concealed.

4.1 CONTOUR MOUNTS

Perhaps the most common of all supports is the contour mount, an armature that provides contiguous intimate support along the profile of an object. Although contour mounts are typically positioned at the rear of an object and might not be visible from the front, they often remain visible from the side view. Figure 1 provides an example of how material choice can play a role in minimizing visibility. With more than eight times the inherent stiffness of acrylic, a steel contour mount has clear benefits because the acrylic mount (fig. 1a) must make up in width what it lacks in material strength. The steel contour (fig. 1b) achieves the same amount of protection in a manner much more sympathetic to the unique shape of the object and renders the mount much less visually intrusive. Although these mounts differ in appearance, their method of attachment to the display surface is the same: a threaded fastener attached from below the display surface. The advantage of this approach is the concealment of hardware, but it emphasizes the need for the display furniture to provide sufficient interior access to the underside of the deck, enabling the hardware to be easily installed.

(a) (b)

Fig. 1. Visual comparison of material volume of acrylic (a) and steel (b) in contour mounts.

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Fig. 2. Bronze statue on an off-centered single-post support.

4.2 POST SUPPORTS

Perhaps one of the best examples of a visually discreet mount is shown in figure 2, which illustrates a life-sized bronze statue of a victorious youth. Although the mount is clearly visible, its impact is minimized by the support being limited to just one leg. The forces of the off-balanced load on the noncentered post create extra work because the one-post system must be extremely rigid, but the lack of a support in the figure's proper left leg helps keep it from looking peg-legged and static. This approach requires an internal assembly fixed inside the torso of the figure, which in turn provides a firm place to attach a rigid post set at the preferred inclination. In this case, the internal assembly was adhered to the interior of the bronze torso during conservation treatment before acquisition. However, if the opportunity to create a removable internal assembly exists, small components may be inserted through existing holes and mechanically joined, serving the same purpose in a manner that can be removed for study or alteration later.

4.3 FINISHING THE MOUNT TO REDUCE VISUAL IMPACT

The clips shown in figure 3 secure objects displayed at the J. Paul Getty Museum. The faux finish in figure 3a mimics the ochre marble surface of the socle and provides a camouflage of the brass clips, significantly reducing the visual impact of the mount while requiring little advanced planning or elaborate equipment. Although the effect of faux finishing is convincing, its use to make mounts blend with an object is somewhat controversial. Although museum professionals would likely recognize the clips mentioned above as an added entity, the public's ability to discern what is and is not an element of the artifact is somewhat questionable. In addition, many professionals consider the treatment distracting in its mimicry because the talents of the finisher become a topic of consideration, which may compete with the object for attention. If this is the prevailing opinion, a base tone may be used that does not attempt to mimic the object's surface but reduces its visual impact, as seen in figure 3b.

5. CONCEALED MOUNTS

At times an object's structure allows a mount to be fully concealed. The following case studies illustrate various approaches that help achieve this.

5.1 WHEN A RECONSTRUCTION INCORPORATES THE MOUNT

Integration of mountmaking into conservation treatment has many advantages. In the case of the fragmentary vase shown in figure 4, conservators working on the reassembly and reconstruction of the vase agreed to use an acrylic foot fabricated to replace the missing ancient foot. After the acrylic foot was turned on a lathe to match the required profile (fig. 4a), it was mechanically joined to the fills in the bottom of the vessel and provided a base on which the fragments above could be assembled (fig. 4b). In addition to supporting the vessel with an appropriate profile, the hole in the foot's center becomes an anchor point for the assembled vase as a whole, providing maximum stability with a fully integrated and invisible mount.

(a) (b)

Fig. 3. Faux finished clips for a bust attached to a socle (a) and neutral color clips for an ancient amphora (b). (Objects not pictured.)

(a) (b)

Fig. 4. Manufacture of a machined foot for an ancient vase on a lathe (a) and joined to the vase (b).

5.2 EXHIBITION FURNITURE

In certain circumstances, exhibition furniture can be specifically designed to meet the various needs of a given object in a manner that effectively makes it part of the mount itself. This scenario typically involves embedding some portion of the object in the furniture. Objects that are attached to unsightly bases or that have protrusions that extend below what is intended to be viewed provide unique opportunities for mounting in this manner. The use of these protrusions requires that their attachment to the object be of sufficient strength to take the full effects of a strong physical force exerted on them. In addition, to achieve a full vertical capture of the object, the embedded element must have some type of surface cavity or shoulder that can be cast into or restrained.

The statuette of Poseidon in figure 5a has rough surfaced tangs that extend below its feet, providing the opportunity to both embed and trap them in a buildup. The close up in figure 5b and graphic illustration in figure 5c show the cutout and different components of the custom-made buildup. When disassembled, its two-part construction allows the tangs to protrude through the upper deck surface. When the two halves of the split top are joined around the tangs and secured together, the interfaced cutouts trap the eccentricities in the bronze tangs

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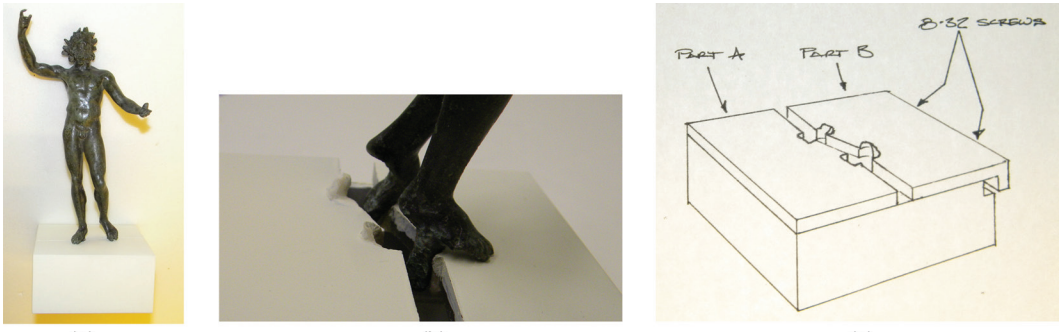
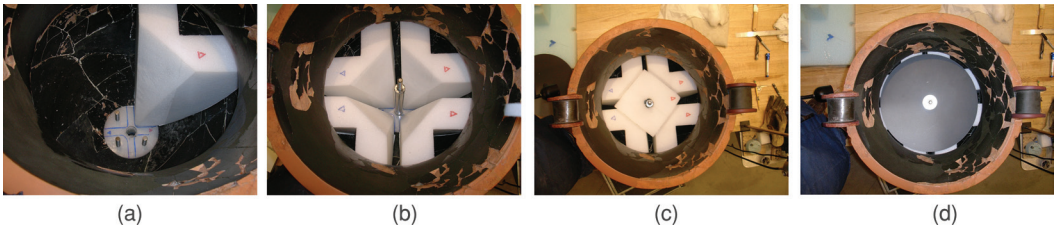


(a) (b) (c)

Fig. 5. Statuette with embedded tangs (a), detail of interfaced cutouts (b), and illustration of split-top buildup (c).



(a) (b) (c) (d)

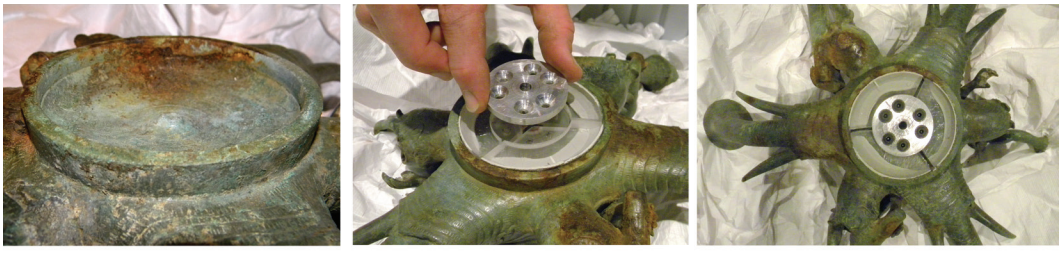
Fig. 6. Insertion of interior mount components around a central tube support in an ancient vase. Top view of interior of vase showing alignment disc at bottom of vase interior with pins for positioning foam inserts and with one of four foam supports in place on its pin (a); all four foam supports in place with a threaded rod and outer tube passing through the bottom disc to the display furniture (b); central wedge positioned to secure the foam supports in place (c); and final disc cover in place and secured lightly with nut on threaded rod (d). The tightening of the nut below the display furniture will put the tube into compression and secure the rigid mount.

and prevent any movement of the statuette. Once the buildup is fastened to a case or pedestal, the object is secure and the mount is invisible.

This method does not require the interfaced cutouts to be adhered to the object, and for the sake of reversibility, adhesion should be avoided. Naturally, a seam is necessary in the display surface that allows the two halves to meet around the object. If the seam is considered a visual distraction, a slight bevel to the edges of its joining edges can lessen that impact. If access through the top of the display is not needed and a seam is unacceptable, it can be filled and painted over after the object is installed.

5.3 INTERNAL MOUNTS

Hollow objects with openings in their bottoms are prime candidates for concealed mounts because their interiors can house an assembly that fastens to the display furniture through the hole in the bottom of the object. Typically, these mounts are sectioned into parts small enough to fit into the object. Once inside, they are assembled mechanically to fit intimately with the interior and then fasten to the furniture. The mount illustrated in figure 6 uses a tube placed under compression as a main structural element. This is achieved by welding a washer to the top of the tube and then inserting a threaded rod through it that extends a few inches beyond both ends. With a nut turned onto the top of the rod and a hole drilled in the display surface directly beneath the tube, the tube and rod assembly is lowered into place with the threaded rod penetrating the drilled hole. From an accessible area underneath the display surface, a nut and washer are attached to the bottom of the rod and tightened, thus putting the tube into a state of compression that maximizes its rigidity. The remainder of the mount consists of foam sections that are arranged around the tube, intimately fitting



(a) (b) (c)

Fig. 7. Assembly of a captured interface mount in the concave interior of an ancient bronze lamp. View of bottom of lamp base, showing base with undercut lip around circumference, which will capture mount components (a); acrylic components in place under lip of base, with aluminum hub being inserted (b); and aluminum hub in place, locking acrylic components under lip of base and providing attachment point for mounting hardware (c).

between it and the interior walls. The foam ultimately is fastened with a joining plate but is independent of the compression placed on the tube, and thus none of that force is transferred to the vessel.

5.4 CAPTURED INTERFACE

Objects that are not hollow but that have eccentric cavities in their bottoms are often candidates for captured interface mounts. The size of the cavity relative to the object can be quite small. Its main requirement is that its eccentric shape provides undercuts that are sufficiently strong to resist the pull-out force equal to the object's own weight. The bronze lamp in figure 7 illustrates a fully mechanical and concealed mount using this technique. The interior walls of the lamp's foot are slightly concave, providing the opportunity to create an interlocking internal mount that may remain completely invisible when the object is placed on display. In this design, three interfaced acrylic sections are held against the concave walls of the foot with a central aluminum hub. When the assembly is fastened together it becomes trapped because the opening in the foot is smaller in diameter than its concave interior. A threaded hole in the center of the hub provides an anchoring point for fastening from under the display surface.

6. CONCLUSION

These examples and case studies are intended to provide a concise look at the possibility of refining mount design and production standards. Although many more approaches exist to making mounts less obvious, the realization that more can and should be done in pursuit of that goal was the main intent. Toward that end, the basic elements required for reducing the visibility of mounts have been summarized here. When striving to produce the most protective and least visible object mounts, it is essential that adequate time be incorporated into any installation schedule. For those working in preventative conservation, whether conservators or mountmakers, gaining familiarity with objects as soon as they are considered for exhibition should be a top priority. With this familiarity, mount design can be developed in concert with the overall exhibition design, with the results being as effective and inconspicuous as possible.

Within the conservation field itself, standards should begin to be established that define the general aspects of an optimum mount. Certainly, many of the same standards that apply to the treatment of objects might easily apply to the mounts that support them—from reversibility to function and appearance. As an example, the defining standards that apply to the fills on a reconstructed vase could also apply to object mounts. Filled areas of a reconstruction, which replace lost fragments and support the rest of the form, can have a profound effect on an object's stability and appearance. Although aesthetic approaches can differ greatly as to the finished appearance of those fills, current standards dictate that they must be structurally sound, uniform, refined, and as discreet as possible. These aspects are directly applicable to object mounts as well, but too often, without the necessary time, resources, and standards, mounts are made in haste with little other than functionality as a guide. Such mounts therefore

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often create a distracting presence, which might be structurally effective but decrease one's appreciation of the beauty and subtleties of the objects on display.

With the recent formation of mountmaking groups, as well as lectures and articles on a wide variety of approaches that seek to establish standards within the field, the realization that more can and should be done to refine mountmaking appears to be taking hold. Reviews of a recent international mountmaking forum can be found in the Further Reading list. For those involved in preventative conservation, the opportunities to create new standards and approaches to stabilizing objects are many, providing fertile ground for research, experimentation, and advancement well into the future.

REFERENCE

The Engineering Toolbox. www.EngineeringToolbox.com (accessed 6/4/12).

FURTHER READING

Wordpress: Dan Cull's review of the 2010 International Mountmaking Forum at Smithsonian's NMAI. http://dancull.wordpress.com/2010/10/26/the-international-mount-making-forum/.

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AUTHOR BIOGRAPHY

McKENZIE LOWRY received a bachelor of arts degree in art studio at the University of California at Davis in 1985 and a master of fine arts degree in painting and drawing from Washington State University in 1987. He taught drawing at the California Institute of the Arts from 1991 to 1994 and taught mixed media sculpture at the Heart Foundation from 1994 to 1995. In 1997, he joined the antiquities conservation staff at the J. Paul Getty museum as a mountmaker. McKenzie has presented numerous papers outlining the Getty's broad approach to seismic mitigation for art and artifacts, including seismic symposia in Malibu, Istanbul, Tokyo, and Palermo, as well as the Fourth World Conference on Structural Control and Monitoring at the University of California at Davis and the Noontime Academy at Scripps College, Claremont, California. In 2008, McKenzie and his colleagues hosted the first Mountmaking Forum at the Getty Villa, where he acted as a moderator throughout and provided closing remarks. In May 2010, the Smithsonian Institute hosted the second International Mountmaking Forum, and McKenzie presented a paper that addressed diverse methods of concealing object mounts. McKenzie offers supplemental instruction in mountmaking techniques and principles at the University of California, Los Angeles, graduate program in archeological and conservation studies on the Villa campus and occasionally acts as an adviser to local museums regarding seismic mitigation techniques. Address: 1200 Getty Center Dr., Suite 1000V, Los Angeles, CA 90049-1687; mdlowry@getty.edu

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