on its own; rather, he shows the power of the discipline’s investigative practice. He reveals, through his own example, how structural engineers can respond to each individual project’s opportunities and challenges. Employing a “first principles of engineering” approach (not relying on conventional solutions but taking problems back to their most basic principles) and applying his inquisitive mind, Robertson opened potential new directions for building design. Within the book’s pages, he rarely presents the final design of a project as a static certainty; instead, he portrays it as a result of a complex process of discovery—negotiating personal relationships among collaborators, restrictions in site or scale, changes in finance and schedule, fabrication and construction demands, and so on. In his collaborative and vocal role as structural engineer, Robertson was vital to the success of these projects.

Throughout the text, he shows the boundaries between architecture and engineering to be fluid and difficult to define, as the book’s title conveys. At times he appears to be addressing both professional fields, as with sections titled “Some Views of Architecture and Engineering” and “Approaches to Architecture, Engineering, and Life.” At other times, while he may be specifically addressing engineers (as in sections regarding history “as seen through the eyes of the structural engineer”), the stories are really a commentary on the working relationships among various professions. Furthermore, although Robertson claims he was never interested in becoming an architect, he is consistently eager to account for his architectural contributions. He describes ridiculous instances of architectural hubris and incompetence yet remains dedicated to the intrinsic value of architecture as a public and artistic pursuit apart from structural engineering. In addition, many of his architectural clients became close friends, his relationships with them blurring the professional boundaries and hierarchies intrinsic to the position of consulting engineer. As Robertson’s tales unfold, it becomes difficult to determine which design elements are to be attributed to which individual or profession. This messy association is not necessarily something to be criticized; rather, it can be seen as reflecting the true nature of the collaborative process between architects and engineers. And despite the many criticisms embedded in the text, it is evident that Robertson has a deep respect for the practice of architecture.

Never short on self-confidence, Robertson asserts his own essential role as a structural engineer engaged in architectural production. Incredibly ambitious—and at times shrewd—he paints himself as a compelling, contradictory personality, both humble and arrogant, deeply philosophical, and surprisingly petty. The book’s anecdotes describe Robertson’s own determination in a world of high-stakes design, with slammed-down telephones, contractual standoffs, and backroom deals. His flair for storytelling is evident, while ranging from focused to sporadic. Adept at name-dropping and telling fantastical tales, Robertson relishes the opportunity to tell his own story. Yet his self-certainty ultimately leaves the impression that there are other, untold sides to the events he recounts. Recent scholarship such as Dale Allen Gyure’s book on Yamasaki has begun to examine the architects of this era, and there is undoubtedly a fuller picture behind the projects Robertson describes and the architects he worked with.1

In addition, Robertson does not fully describe his rich working relationships with other engineers in his own firm. From the beginning of the World Trade Center project until 1983, Robertson was officially running the New York office of the Seattle-based firm of Worthington, Skilling, Helle & Jackson (which became Skilling, Helle, Christiansen, Robertson in 1967). Both John B. Skilling and John V. “Jack” Christiansen (who were, like Robertson, elected members of the National Academy of Engineering) worked as partners with Robertson for more than twenty years on projects around the world—only some of which are included in this book. This assortment of talent was truly remarkable and made the collective office a significant structural engineering firm. With Christiansen’s early retirement in 1983, the firm formally split to become the Seattle-based Skilling Ward Rogers Barkshire (now Magnus Klemencic Associates) and the New York-based Leslie E. Robertson Associates (LERA). While it is true that each office led specific projects and each partner had unique talents (Robertson indeed credits Skilling and Christiansen in some instances), attention to the larger firm would have added richness to Robertson’s account. The book is also notable for the way Robertson establishes his personality and identity as a structural engineer. His explicit dedication to pacifism, engagement, and social justice, linked to his own early experiences, is admirable and resonates throughout the text. Robertson’s personal stances become vital to his story as he poignantly describes the devastating events of 9/11. In this section, he recalls deeply personal, emotional memories, as well as his own contemplations as he struggled to come to terms with the disaster’s full scope. Writing as citizen, structural engineer, and pacifist, he expresses himself in words that are appropriate and poetic, sensitive and aware, and his prose shines. Robertson’s resolve and dedication to broader issues are refreshing, as it is far too rare for structural engineers to state their own ethical or moral positions. Whether because of fear of isolating potential clients or because such values and actions are not taught or encouraged by the academy, few practitioners of structural engineering have demonstrated as much personal engagement with vital social and cultural issues as Robertson has.

Although unconventional, this book is a valuable contribution to the study of the mutually dependent fields of architecture and structural engineering. More than simply showcasing Robertson’s exemplary work, The Structure of Design provides a broader sense of the personal nature of structural engineering practice and the intimacy that can develop between engineers and their architectural clients. While creative tensions are embedded within that relationship, Robertson shows how a conceptual fluidity between structural engineering and architecture can be a powerful source of invention and inspiration.

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Note

Stephen Kite
Shadow-Makers: A Cultural History of Shadows in Architecture
London: Bloomsbury Academic, 2016, 331 pp., 125 b/w illus. $43 (paper), ISBN 9781472588098
In his excellent collection of essays *Shadow-Makers*, Stephen Kite proposes to bring shadows “out of the shadows” (5)—a reasonable objective, given that architecture in recent years has been slanted toward the making of great, illuminated spaces, shiny surfaces, and the minimization of darkness and all manner of unhygienic stuff. “Shadow has had a ‘bad press’” (7), Kite claims, at least since Plato’s cave parable in the *Republic*, in which confined prisoners know reality only through shadows cast by activities they cannot directly see. As shadows take on a life dissociated from their sources and the light that cast them, they become untethered from reality, and it becomes difficult to verify their truth. The cultural associations of darkness are often negative and include—as we know even without reading this book—the unknown, the sinister, ignorance, dirtiness, ugliness, sadness, unhealthiness, chaos, perdition, and evil. Kite finds the sources of our built shadow world and affirms their connections to constructed reality such that they are no longer sinister; rather, as Kite notes, citing Louis Kahn, they illustrate that shadow belongs to light (288).

No wonder we fear the dark. We know our world as a light-filled place interrupted by darkness, and we link gloom with specific places: caves, basements, attics, crypts, and the underground. But in the history of art and architecture, and on our better days, this menu of nastiness confronts a greater truth: the universe is a beautiful, dark place, with darkness and light as companions. In the sanctuary, the heavy, shaded concrete roof structure presses downward, while light monitors dose the space’s four corners in daylight. Darkness compresses and focuses the room while daylight responds with an upward rush of space into sky. This interplay of daylight and darkness is introduced in the “folding” of the exterior masonry walls to capture daylight and shadow. The hand of Kahn is present as his pencil marks develop shadows and find spaces modeled by darkness in rough studies and drafted renderings of the north elevation. The examples cited in this book range from the making of shadow in Islamic settlements to the last two church projects of architecture’s modern prince of “loomism,” Sigurd Lewerentz. Introducing the reader to the book’s topic in the first chapters, Kite engages in cultural and literary referencing that is dense with obscure wisdom and well-known observations, much of which is well worth following up. But the thread of the author’s argument frays in a tangle of citations, where the reader wants a firm foundation for the book’s subsequent and intelligent architectural narrative. For those interested in the influence of daylight and darkness in architecture, this book may be worth buying for the wealth of references alone, but readers will want to approach it with smartphones or laptops nearby so that they can search references and call up additional images.

*Shadow-Makers* concludes with a valuable speculation. Computerized drawing, Kite suggests, has influenced and will continue to influence the making of architectural shadows. His point is well taken, but
there are better examples than those he presents. Hand drawing and software are not mutually exclusive; they may be deployed in hybrid formats to evoke the best of both. The former method tends to formulate darkness as something that inheres in form; the latter, situated in code, invokes darkness only when it is ordered up, and shadows can be suppressed while form and space are conceived lightlessly. The most convincing modern experiments in shadow and built form are still those that anticipate parametric methods: Rafael Moneo’s Murcia Town Hall (1991–98); Louis Kahn and Anne Tyng’s “modified space-frame motif ceiling” at the Yale Art Gallery (1953), an image of which graces the cover of Shadow-Makers; and, of course, Lewerentz’s churches of the 1950s and 1960s. The shift from handmade to digital representation in architecture parallels a similar shift in popular music production. We have means of making that were unimagined just a few years ago, but the depth and meaning of the compositions are not necessarily intensified. The struggle for coherence resides in tools and methods and yields meaning. Arguably, works like Kahn’s Salk Institute and the Beatles’ Sgt. Pepper’s Lonely Hearts Club Band could not be made today. In both cases, it would be too easy.

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Notes
5. Sarah Williams Goldhagen, Louis Kahn’s Situated Modernism (New Haven, Conn.: Yale University Press, 2001), 56.