Chapter 1

# Normate Template

## *Knowing-Making the Architectural Inhabitant*

> Until universal/inclusive design is infused in pre-professional and continuing education, the attitudes of designers will limit their understanding and appreciation of diversity. They will continue to shape their designs for a mythic average norm, creating barriers that exclude the contributions and participation of people all over the world.
>
> —ELAINE OSTROFF, "Universal Design: An Evolving Paradigm"

Ask an architect about their work, and you may learn more about the style, form, materials, structure, and cost of a building than the bodies or minds meant to inhabit it. Examine any doorway, window, toilet, chair, or desk in that building, however, and you will find the outline of the body meant to use it. From a doorframe's negative space to the height of shelves and cabinets, inhabitants' bodies are simultaneously imagined, hidden, and produced by the design of built worlds. Since the mid-twentieth century, supporters of more accessible, inclusive, and user-centered design have contended that design for the "mythic average user" shapes architects' default practices. For any of us who have failed to fit, even temporarily, into the ready-made structures of clothing, furniture, workplaces, homes, and other designed things, this point is rather unsurprising. The related idea that "the world was not designed with disability in mind" is, in one sense, a statement about omission and ignorance as ways of knowing and thinking. In another sense, however, it is a statement about omission and ignorance as material arrangements, ways of making and unmaking the world's inhabitants through unintentional but accumulated practices.

Although it is easy to claim that the world was designed with an average user, rather than a disabled one, in mind, this claim tells us very little about the norms, habits, and practices that have shaped our historical and current built environments. To understand the projects of accessible and inclusive design, we must understand the world into which these projects were born. This chapter considers how architectural design for an unmarked, normate inhabitant materialized from historical habits of perception and practice. I offer the concept of the "normate template" as a



Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

useful abbreviation for the complex, critical notion that the world was designed with normate inhabitants in mind. Despite historical shifts in scientific understandings of the valued body and aesthetic standards of good design, I argue, the normate template has served as a historical pattern language for Western traditions of architectural design since antiquity, and it was these patterns that the twentieth-century phenomenon of access-knowledge emerged to unsettle.

## HISTORICAL NORMATES

A universal body has served as a template for the architectural user for centuries.[1] This "mythic average norm" is not a neutral body but rather a particular white, European, nondisabled, youthful, and often masculine figure whose features remain unmarked.[2] But to understand how the mythic average norm or normate became an unmarked template for good design, we have to engage more closely with histories of knowledge. Disability studies scholars and historians of science have argued that the concepts of "normal" and "average" are relatively recent phenomena, appearing in the nineteenth century with the birth of statistics to produce modern forms of power.[3] As Lennard Davis concludes, the norm has a prescriptive function, which stems from its reference to real population data, unlike the earlier, classical notion of the "ideal" body, which referenced mythic figures divine in form.[4] For Davis, this is what makes the figure of the norm insidious: when norms purport to represent "real" populations, it becomes possible to attempt to align those populations with the average, consequently making normates appear as natural or neutral.

In other words, norms do not simply reflect probabilities within populations. In shaping the "real" population, norms become prescriptions for normalcy. For architectural design, however, these distinctions between the impossible ideal, the descriptive average, and the prescriptive norm are not as salient. Because architecture is a world-building practice, references to ideal and average inhabitants have shared a prescriptive function. These prescriptions, I will show, have been central to ideas about architects as knowers and makers.

### Classical Normates

In the first century BC, Roman military architect Vitruvius prescribed an ideal body as the template for beautiful architecture.[5] In apparent reference to Greek mathematician Protagoras's precept that "man is the measure of all things," Vitruvius declared that as within the body ("designed by nature"), "there is a kind of symmetrical harmony between forearm, foot, palm, finger, and other small parts; and so it is with perfect buildings."[6] The evidence of this natural harmony appeared in the body's internal and external proportions: parts of the body, such as the palms, corresponded to other measures, such as height, and by extending its appendages into space, the ideal body would have its naval at the center of a circle, leaving the head, arms, and

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

toes to create a perfect square.[7] Vitruvius naturalized a classical, ideal body by locating the human body in relation to nature and the cosmos but also prescribed this body as the template for beautiful architecture.

Ideal embodied proportions were not merely the stuff of imagination, however. These proportions *materialized* in classical architecture modeled after the ideal body.[8] Buildings likewise materialized the existence of certain *bodies*—presumably white, masculine, nondisabled citizens—as the most likely inhabitant of public space. Knowledge of such a body and its proportions further defined architectural work itself: authoritative architects, for Vitruvius, were those who had mastered knowledge of human life, culture, and embodiment, and not just the geometries or functions of built and engineered forms.[9] Classical models of body-knowing thus engendered normative, authoritative knowing-making.

## Scientific Normates

Vitruvius's account of the universal body, eclipsed in the Middle Ages, reappeared in the Renaissance, alongside the birth of modern science.[10] In 1490 Leonardo da Vinci depicted the "Vitruvian Man" as a white, youthful, masculine, muscled, and standing body, arms and legs extended into space, with a flowing mane of hair (Figure 1.1). While Da Vinci retained Vitruvius's interest in the body as an instrument of measurement, its specificities were obscured by its transcendent appearance.[11] The drawing soon became a new, shared iconography for both medicine and architecture, which referenced antiquated truth claims about bodily proportions.

The Vitruvian Man's status as a scientific object was short-lived, however. In the nineteenth century, positivist standards of knowledge, premised upon the validity of statistical data, gained traction within architecture. Modeling itself after scientific disciplines, the discipline of architecture established standards of practice and perception, which distinguished the creative work of artists and the technical labor of drafters and builders from the architect's professional authority regarding style and form.[12] Architects discredited the Vitruvian Man as a depiction of classical proportions, and historians criticized Vitruvius for conflating ideal bodies with material realities, challenging the accounts of mathematical proportionality that da Vinci had illustrated.[13] In its visual, material manifestation, the Vitruvian Man's proportions were thus revealed as myth and illusion. As a misfit, the figure became an untruth.

Yet representations of bodies resembling the Vitruvian Man became new epistemic objects in the nineteenth century. Positivist statisticians, criminologists, physical anthropologists, and early eugenicists reproduced similar figures in the new material culture of anthropometry, or the measurement of human populations with calipers and rulers for statistical calculation (Figure 1.2). Although claiming to be distinct from practices such as phrenology, anthropometry deployed similar representations and truth claims (Figure 1.3). In this sense, the practice was engaged in what Foucault calls "games of truth," trained at producing new arrangements of knowing-making.[14] Its

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

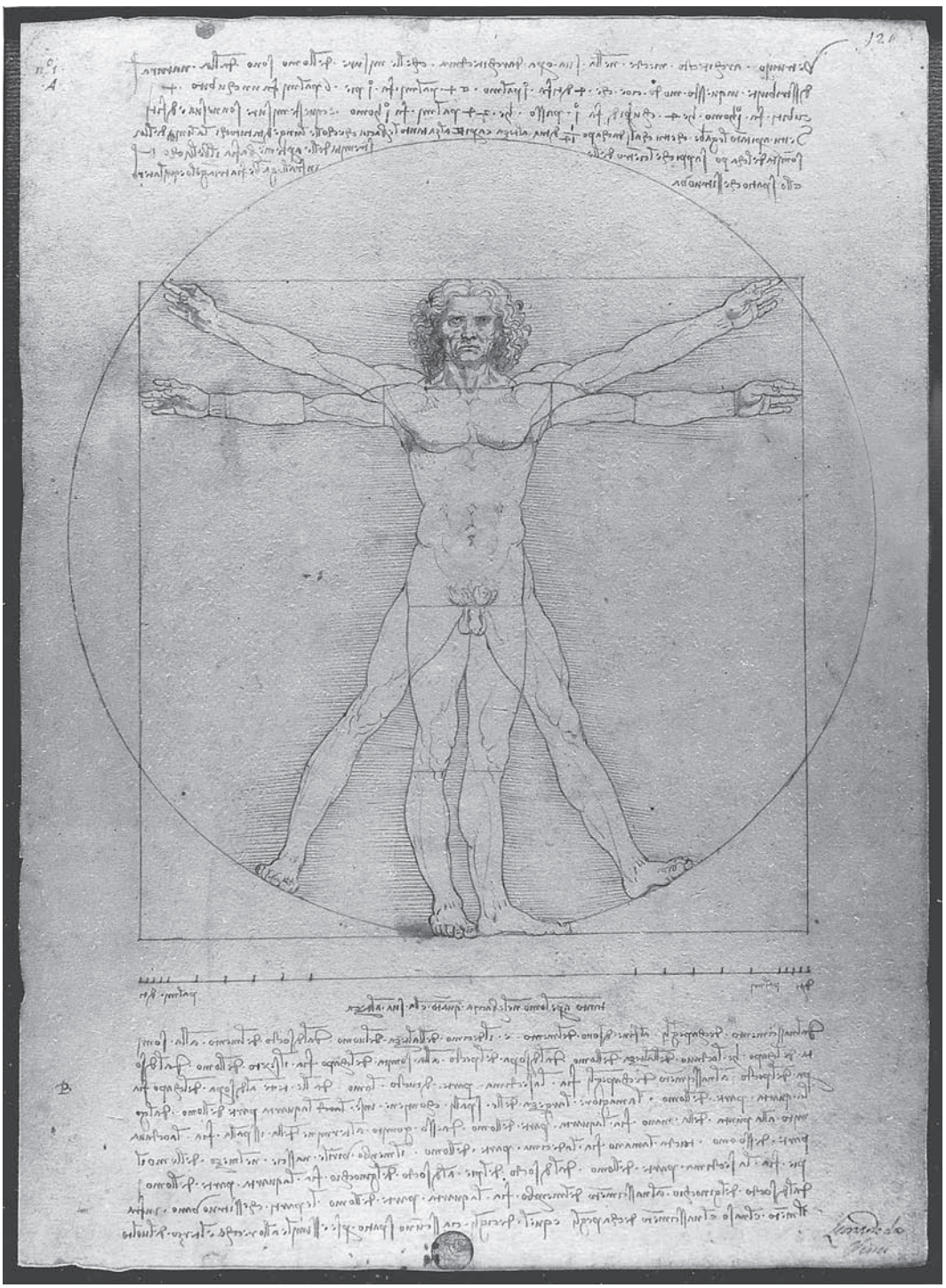


Figure 1.1. Leonardo da Vinci, *Vitruvian Man* (ca. 1490). Courtesy of Luc Viatour / www .Lucnix.be.

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

initial, direct application was a new racial science, which sought to provide conclusive and comparative evidence of the supposed degeneracy of nonwhite, disabled, poor, and "feeble-minded" people.[15] Anthropometric data made it possible to calculate population averages (or norms), as well as standard deviations (or ranges of difference from the norm).

A positivist practice par excellence, anthropometry rendered the Vitruvian Man as fully normate: calculable, legible, a standard against which difference could be measured, and frequently, as in criminological and eugenic discourses, evidence of the supposed moral and aesthetic truths of normate bodies.[16] Despite claiming to be a new science, anthropometry shared many of the aesthetic and epistemological conventions of the classic, universal body. Vitruvius had claimed, for instance, that the body was a reflection of proportions of the universe. Although astronomical science had shifted, anthropometrists such as Adolphe Quetelet borrowed astronomers' methods of plotting data about cosmic events (such as planetary movements) to measure, model, and depict human bodies at the population scale.[17] The Gaussian curve, or "bell curve," thus became a well-known technology of demarcation between average and deviation, normate and misfit. At the curve's center, Quetelet's "average man," the most statistically probable body, resembled da Vinci's Vitruvian Man, a

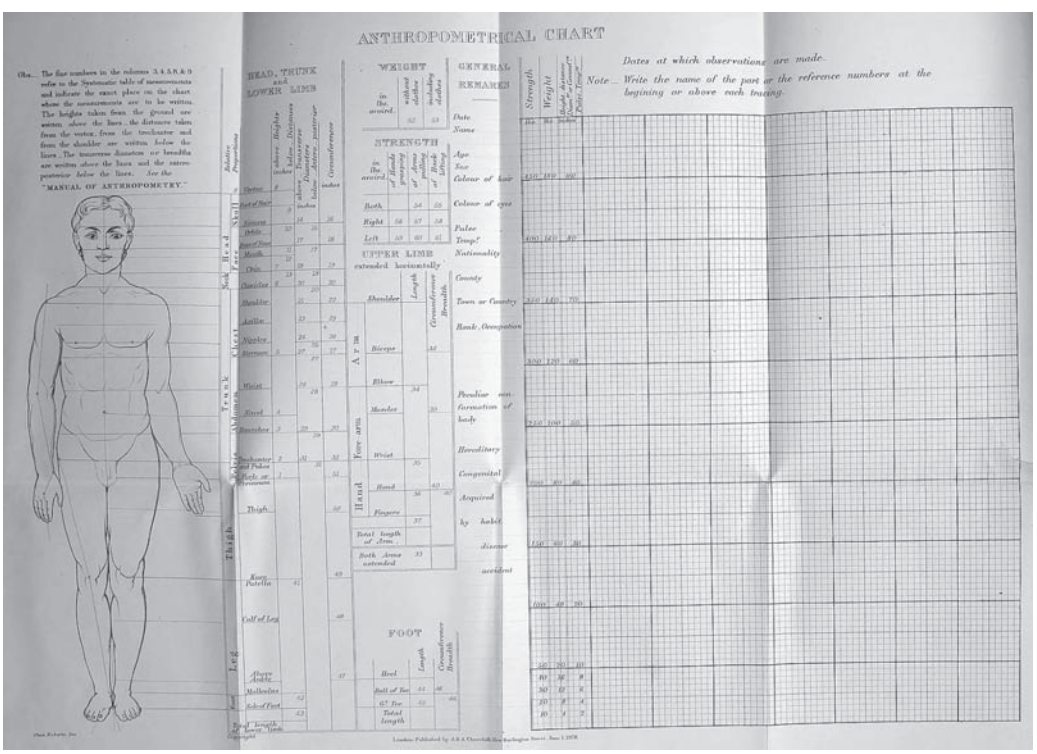
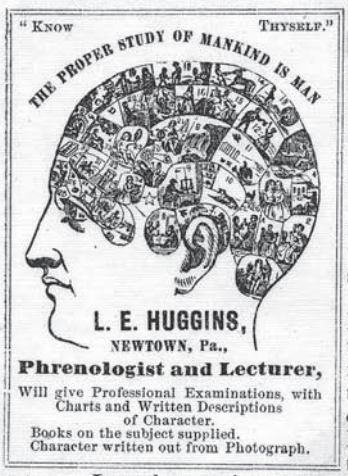



Figure 1.2. Charles Roberts, anthropometrical chart, *Manual of Anthropometry* (1878).

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

# Phrenology is True




Phrenology is the only mental science that has ever attempted to delineate the character of a perfect stranger, and tell his capabilities and characteristics. This, Phrenology has done so often, that it remains no longer a matter of doubt. It teaches men what they are, and what they may become. It is in short the *science of man*.

The great creator has made laws governing us, both in the mental and physical domain, and it remains for us to know these laws to attain our highest usefulness.—Phrenology unfolds to us these unchangeable laws of nature. It teaches man's true relation to his fellowman.

Horace Mann, says: "I look upon Phrenology as the guide to philosophy and the handmaid of Christianity." I need not look so far for testimony in favor of Phrenology.

I am at liberty to use the following names of citizens of New Hope, Pa., and Lambertville, N. J., in testimony of the usefulness and truthfulness of the science of Phrenology. They also recommend L. E. Huggins to the public as a successful practicle delineator of character.

NEW HOPE, PA.:

| | | |
|---|---|---|
| Geo. A. Cook, | Lizzie W. Lippincott, | Jos. P. Stockton, |
| Lizzie H. Cook, | Catherine R. Dean, | C. C. B. Johns, |
| J. T. Walton, | P. R. Slack, | T. L. Naylor, |
| S. H. Mathews, | Geo. W. Slack, | Dr. J. W. Scarborough, |
| Will C. Ryan, | C. H. Scarborough, | W. H. H. Murray. |

LAMBERTVILLE, N. J.

| | | |
|---|---|---|
| Lewis C. Rice, M. D., | Lydianna Van Horn, | R. H. Van Horn, |
| S. S. Vanhorn. | James Mullineaux, | C. H. Skillman. |

## L. E. HUGGINS,

*Will give a Course of Lectures*

## ON MAN AND HIS BEST INTERESTS,

*Mentally, Morally, Physically, and Passionally,*

*At* .....

*On* ..... *Evening*,

..... *at* ..... *o'clock.*

*Admission*, .....

*Private examinations given at* .....

*Families and parties visited when invited.*

Clark Pierson, Printer, The Record Office, Lambertville, N. J.

Figure 1.3. Phrenologists claimed the truth of their practice to establish authority. L. E. Huggins, "Phrenology is True" (ca. 1870). Courtesy of Warshaw Collection of Business Americana, Archives Center, National Museum of American History, Smithsonian Institute.

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

former depiction of universal nature and harmonic proportionality: white, youthful, masculine, and able-bodied.[18] The bell curve, like Vitruvius's prescriptions for architecture, married description with prescription, rendering the most statistically probable bodies (i.e., the average or norm) as natural.[19]

## Modernist Normates

While on its own, a statistical average may be an object of knowledge, a fact reflecting evidence of a population, normative prescription (or standardization) involves aligning a population or practice with norms of embodiment or behavior. If the normate template came into contact with standards of "good knowledge" in the nineteenth century, in the twentieth, it became an instrument for prescribing particular forms of knowledge in relation to Modernist architects' standards of "good design." An unmarked subtext for these standards was the "ideology of ability," which disability theorist Tobin Siebers defines as the societal "preference for able-bodiedness."[20] Modernists recapitulated earlier notions of geometric harmony and beauty through the new language of positivism, emphasizing an objective view of good design as premised upon the standardization of production. Design historian Stephen Hayward argues that while determinations of good design are often couched in seemingly neutral, descriptive terms, frequently in relation to generic values such as "common sense," they produce new arrangements of space, power, and knowledge.[21] Working as an instrument of what Foucault terms "games of truth" and sociologists of science describe as "boundary work," the normate template played an essential role in delineating "good design" from "poor design" in reference to dominant political, economic, and aesthetic interests.[22]

"A standard," wrote Le Corbusier (Charles-Édouard Jeanneret) in 1923, "is necessary for order in human effort. A standard is established on sure bases, not capriciously but with the surety of something intentional and of a logic controlled by analysis and experiment. All men have the same organism, the same functions. All men have the same needs."[23] Le Corbusier's figure of the "Modulor" followed the Vitruvian Man in conflating classical and scientific conceptions of the body and depicted the "harmonious measure" of the spatial inhabitant deemed "universally applicable to architecture and mechanics."[24] Similar to the apparent impartiality of Western science, figures like the Modulor portrayed a particular body, arranged from historical and contemporary ways of knowing-making, as a universal, impartial "view from nowhere."[25] In one sense, Modulor appeared to conflate (and thus misunderstand the distinction between) the ideal and the norm. In another, the figure complied with a long tradition of conflating real and ideal bodies to realize universal geometric harmonies in material form.

To claim authority and advance particular social, aesthetic, and industrial projects, Modernists appealed to the normate template's "scientificity," or what Foucault describes as the perceivable qualities of contemporary standards of what counts as science.[26] Put simply, describing something as scientific grants it the power and authority

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

of supposed truth and objectivity. In Modernist games of truth, highly rationalized, standard forms served as currencies for determining the aesthetics and function of so-called good design. In 1932, for instance, Buckminster Fuller calculated that good design was premised upon the integration of aesthetics with standardizing modes of knowing-making, or as he put it, "*Science + Art + Industry = Universal Architecture.*"[27] This technoscientific standard (centered on what could be knowable, beautiful, and efficient) was purported to have the timeless quality of universality. Scientificity, in this case, appended references to nature, harmonic geometries, and the cosmos as a source of authority.

While Modernist notions of good design referred to early twentieth-century practices of industrial efficiency, they combined references to classical concepts of universality and modern notions of standardization to solidify the architects' role as a design authority. Echoing Vitruvius, the modernist Congrès internationaux d'architecture moderne (CIAM) wrote in 1933 that architecture should be "placed at the service of man," "facilitate all of [man's] actions," and be produced by architects possessing "perfect knowledge of man."[28] Modernist architecture fulfilled the expectation of "perfect" knowledge by positioning architects as experts on both design and universal human needs.[29]

The expectation of a universal white, male, nondisabled body continued to represent the default, normate inhabitant, with severe consequences for nonnormate populations. In the United States, where the overlapping demographics of people of color, women, and disabled people faced discrimination and segregation, the normate template reinforced the effects of Jim Crow laws, immigration policies, gender discrimination, and institutionalization.[30] The social project of eugenics, which was determined to cull supposedly defective bodies from the population, also changed the nature of spatial inhabitation: public space, often associated with freedom, became a site of management, surveillance, and control for vulnerable populations. Disability and design historians Christina Cogdell, Susan Schweik, David Mitchell, and Sharon Snyder have documented wide-ranging mechanisms of eugenic environmental design: early twentieth-century "ugly laws" prohibited people with atypical bodies from entering public space, eugenicists measured the traits of "feeble-mindedness" according to an individual's ability to cope with urban environments, and eugenic ideologies of "streamlining" influenced the aesthetics of industrial and product design of the 1930s.[31] Denying nonnormates access to public space created the illusion of their nonexistence, which consequently resulted in less-accessible environments.

The standardization of architectural inhabitants both resulted from and produced twentieth-century standards of professional architectural knowing-making. Normate bodies became legible to architects through professional handbooks, such as Ernst Neufert's *Architect's Data* in Europe and Charles Ramsey and George Sleeper's *Architectural Graphic Standards* in the United States (first published in 1936 and 1932, respectively), which offered standard "orthographic" conventions for depicting features

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

such as doorways, windowsills, stairs, and roofs.[32] Orthographic drawing, a convention of architectural drafting, sought the ordered representation of architectural space. But the Latin "ortho-," meaning upright or correct, also captures the dual function of architectural standards: orthographic drawings both defined and prescribed the typical features of built environments.[33] Alongside standard doorways or roofs, depictions of the standard inhabitant, decorated with notations of measurement and size, staged the legibility of normate spatial users.

Representations of normate bodies followed the Modernist synthesis of classical representations and concepts with contemporary scientific standards.[34] Beginning with the third edition (1941) of *Graphic Standards* and persisting until its seventh edition in 1981, a set of black-and-white drawings titled *The Dimensions of the Human Figure* (Figure 1.4) appeared near the end of the book. The drawings referenced the conventions of da Vinci's Vitruvian Man, with arms extended into space and unmarked race, gender, and disability status, which together communicated their intended use as universal figures. The abstract, shaded bodies stood, sat, climbed, and crawled, while dimensional lines and numbers around their periphery provided what appeared to be average measurements.

*The Dimensions of the Human Figure* was a reproduction of an earlier set of identical drawings titled *The Geometry of the Human Figure,* which appeared in 1934 in *American Architect and Architecture* magazine.[35] On the surface, the function of these depictions appears translational: for architects without advanced mathematical training, the drawings seemed to provide a quick reference to average spatial dimensions. But while artist Ernest Irving Freese noted that the dimensions provided were "based on an average or normal adult" (implying the addition of statistics), architectural historians such as Hyungmin Pai have pointed out that the numerical values did not match any anthropometric data available at the time.[36] What, then, was the function of Freese's drawings, if not to serve as data-delivery devices for architects?

Combined with supposed dimensional data, the figures and their classical proportions were performing other material-epistemic work. One indication is the discursive shift from "geometry" to "dimensions" in the drawings' title, which suggests an equivalence of ideal and normate bodies, a conflation of seemingly historically distinct concepts that found easy relation due to their shared prescriptive status. The numerical dimensions added a hint of scientificity, creating the illusion that these figures were grounded in anthropometric data. But scientificity here is an aesthetic element with a persuasive function, lending architectural practice the appearance of standardization and order.

It would be easy to characterize Freese's dimensional notations, and the anthropometric data that they appeared to reference (however fictively), as pseudoscience. After all, averages are mathematical calculations, not representations of existing, living bodies. This suggestion presumes, however, that there is a real, objective truth about bodily size and proportion awaiting discovery by superior methods and proper

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

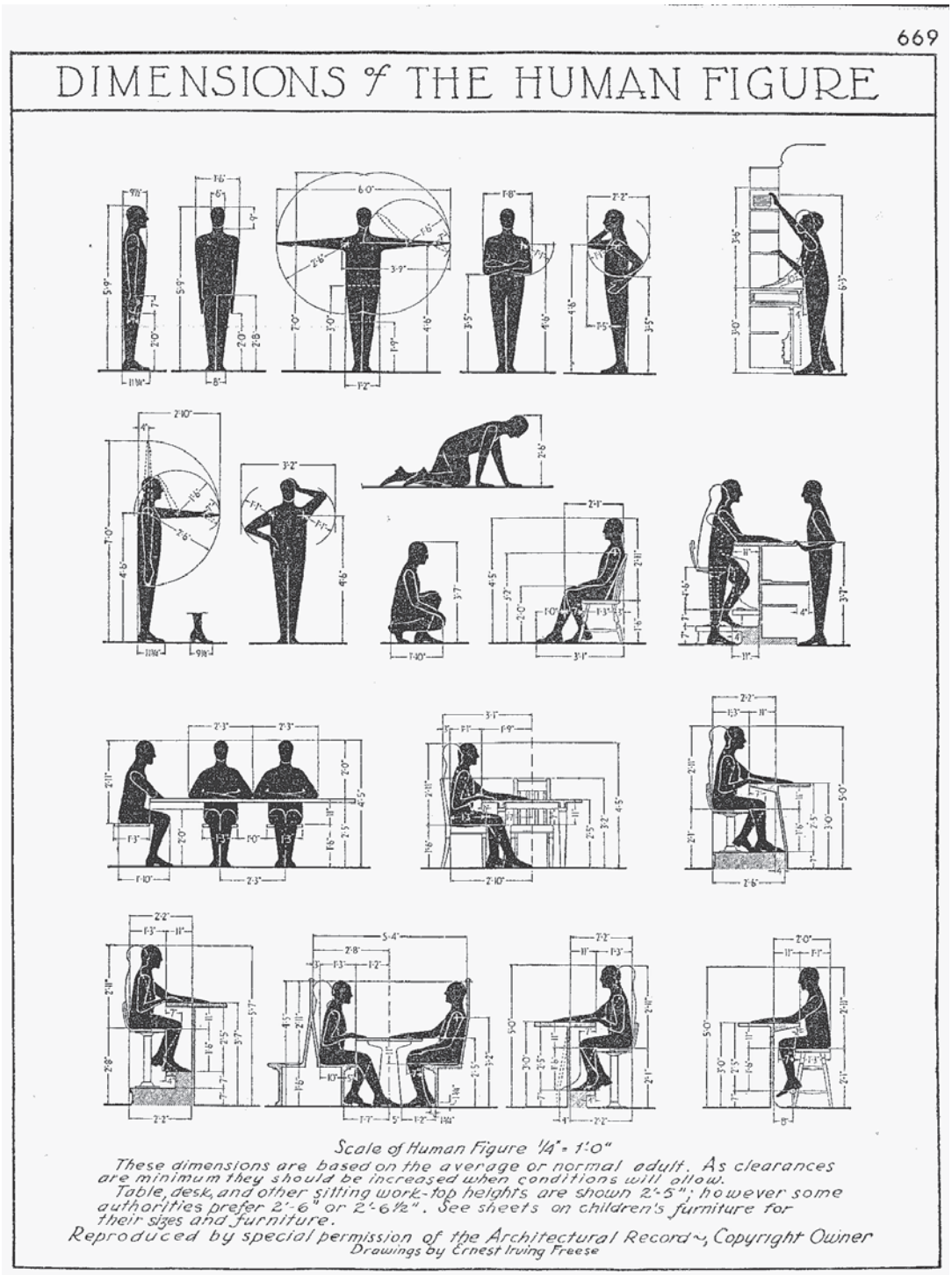



Figure 1.4. Ernest Irving Freese, *The Dimensions of the Human Figure, American Architect and Architecture* 145 (July 1934): 57–60.

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

notations. A different possibility is that architectural knowledge, like laboratory science, is inherently partial, historical, and mediated, whether through tools, representations, sociopolitical contexts, or aesthetic choices. In the case of the normate template, Freese's drawings in *Graphic Standards* highlight the ways that claims about the "truth" of the inhabitants' body are also exercises of power that convey the desirability of particular bodies (and their being-in-the-world) over others, and consequently materialize a world built with an aesthetic ideal in mind.

## THE NEW NORMATES

The universal, the objective, and the scientific are all concepts that work as persuasive devices, even when material forms cannot meet their impossible standards. Freese's figures materialized an early twentieth-century reclamation of classical aesthetics and representations of the body in U.S. culture. Consider that just a year after Freese's figures appeared in *Graphic Standards,* eugenicist Robert Dickinson commissioned sculptor Abram Belskie to create two white, marble sculptures of human figures derived from average anthropometric data. He called these figures Normman and Norma. The classical ideal of the white, masculine, able-bodied citizen materialized in Normman's sculpted form.[37] But Norma's seemingly progressive inclusion reveals shifting norms of the ideal citizen, namely the introduction of the figure of the white, presumably reproductively fit woman as a standard-bearer of the nation, an acceptable prototype of embodiment in an era of racial anxieties about immigrant populations. A 1945 eugenics competition in Cleveland, Ohio, used the Norma sculpture as a reference when it called for a woman whose measurements most closely approximated the average American woman. Although none of the contestants matched Norma's chest, waist, hip, and height measurements, the winner (who most closely approximated the statistical average) was also one who manifested the cultural and aesthetic figure of ideal, white womanhood.[38] The competition, Belskie's statues, and the broader eugenic project served as a normate template for human populations—a kind of "eugenic world building," as feminist disability theorist Rosemarie Garland-Thomson describes it—revealing the close proximity between imagined architectural users and cultural requirements for standardized citizens.[39]

The normate template for architecture defined valuable citizens through more subtle relations of knowing and making. Regimes of legibility and illegibility, in particular, shaped how architects came to create buildings and public spaces with particular inhabitants in mind. Like the process of defining legible *citizens* under law, the project of making architectural inhabitants *legible* to designers entailed defining the center and margins of the population, often through visual representations of at least some of these bodies. While these public, nation-shaping practices shaped the normate template's public face, the standardization of normate world-building often hid them in plain view. The typical understanding that architects only understand

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

and anticipate the most legible, public bodies requires qualification, however, because the normate template also imbued particular forms of invisibility and illegibility with power.

The unmarked normate and its purported neutrality resembled the unmarked harmonic body and its purported relations to a fundamental nature.[40] Freese's figures, for instance, appear unremarkable: they stand, sit, and crawl using two arms and two legs; their dark shade does not appear legible as a racial category; their gender is largely unannounced.

Adjacent to one normate figure, who stands with arms extended forward in profile, Freese depicts a single, high-heeled shoe (see Figure 1.4). Architectural critic Lance Hosey argues that the shoe, with its higher heel and smaller dimensions, is meant to represent female embodiment as simultaneously an object of knowledge and a deviation from male norms.[41] To make the female inhabitant legible, Freese engages in an act of seemingly benign differentiation, achieving a marginal gain in diversity while reinforcing the standard, normate body as the template for architecture.

Read another way, however, the shoe illustrates the trappings of normate legibility modeled on aesthetic visibility, scientific calculability, or political citizenship. The high-heeled shoe is easy to miss. But it alone raises questions about the presumed universality and objectivity of the other figures. If we take Freese's drawings as a historical artifact, rather than an objective prescription of good design, the shoe offers a subtle hint of ways of being, moving, making, and knowing that standard architectural representations fail to provide.

## ACCESS-KNOWLEDGE

The high-heeled shoe is a marginal, imperfect crack in a broader artifice of the "mythic average user." But if it scores the normate template's smooth surface to reveal other possibilities of knowing-making, we might wonder, what were these possibilities, where were they located, and what new worlds did they configure? In the twentieth century, a new regime of legibility and illegibility began to take shape in the normate template's shadows. This regime, which I call *access-knowledge,* was at first undetectable. By design, it worked below the surface of material forms, such as buildings, streets, or cities. Its purpose was to disrupt the normate order of things. And its public face, its most visible elements, appeared to be integrated into, rather than in disruption of, this order.

### Legible Users

In 1981 Freese's drawings disappeared from *Graphic Standards,* where for forty years they had resided at the back of the book, between entries for "Metal Gauges," "Abbreviations," and "Modular Coordination." The handbook's seventh edition replaced *Dimensions of the Human Figure* with new anthropometric drawings of a man and a

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

woman (Figure 1.5).[42] By appearance, the two figures closely resembled Norma and Normman in their white, standing, rigid, dimensional bodies. Their names were Joe and Josephine and the dimensional data attached to their bodies represented decades of research on human engineering and performance, culled by Henry Dreyfuss Associates, specifically industrial designer Niels Diffrient and human factors researcher Alvin Tilley.[43] Two other figures appeared on adjacent pages, representing a wheelchair user and a person using crutches—both without other identifying characteristics. The accompanying text offered suggestions for designing for blind, deaf, and hard-of-hearing people (Figure 1.6). For all these figures, dimensional data indicated upper and lower percentiles, in addition to the average.

Following the civil rights era, the figures appeared to represent social progress toward a greater diversification of architectural inhabitants—a new design approach directing architects away from the normate template and toward diverse ways of knowing-making. Printed at the handbook's beginning, the new figures seemed to

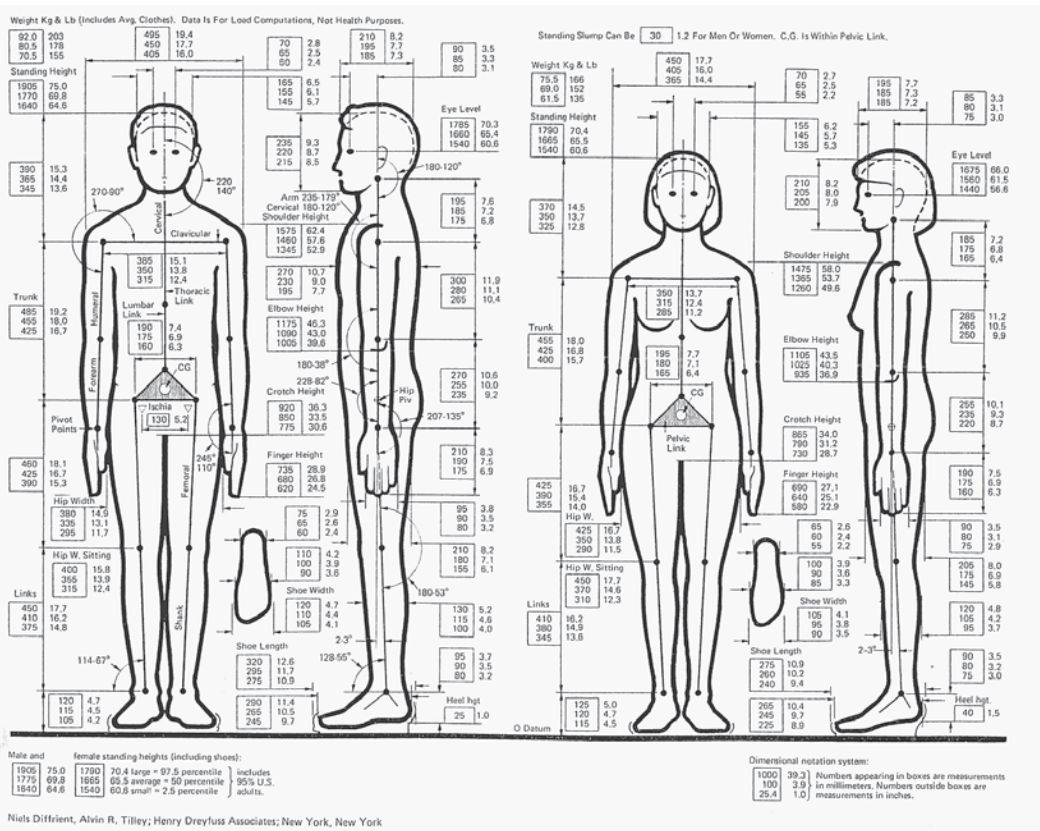



Figure 1.5. Anthropometric figures, such as Joe and Josephine, offer dimensional figures with added statistical data. Charles Ramsey and Harold Sleeper, *Architectural Graphic Standards,* 7th ed. (New York: Wiley, 1981). Courtesy of Judy A. Crookes, Henry Dreyfuss Associates.

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

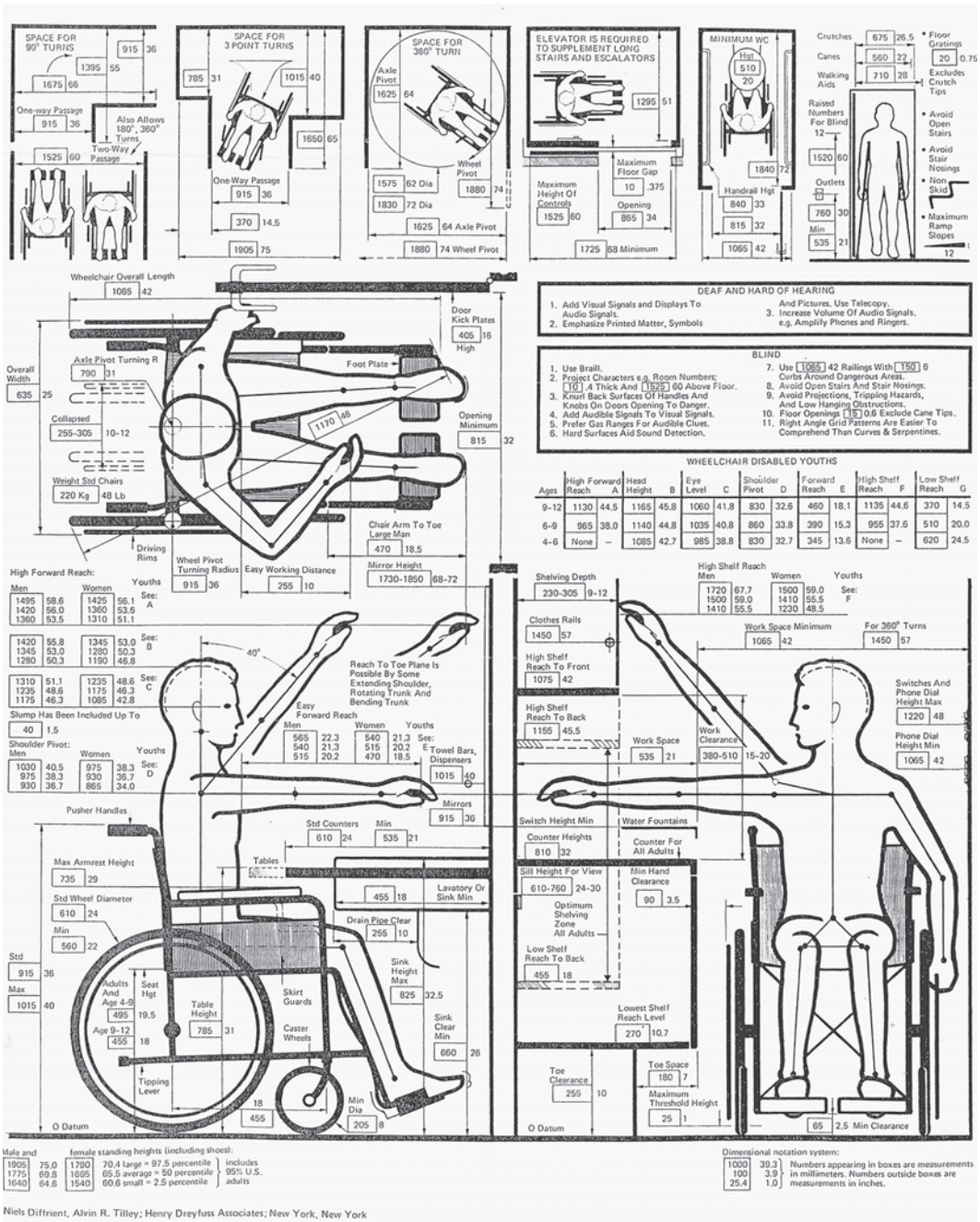



Figure 1.6. Anthropometric figures representing disability often depict a wheelchair user and, to a lesser extent, figures using canes or crutches. Charles Ramsey and Harold Sleeper, *Architectural Graphic Standards,* 7th ed. (New York: Wiley, 1981). Courtesy of Judy A. Crookes, Henry Dreyfuss Associates.

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

suggest that architects could finally design with a range of users in mind, not as an afterthought but throughout the entire design process. But these figures did not appear from thin air. They were not an indication that well-intentioned architects had simply sought out better information about users. Nor did they unseat the normate template. What happened, then, between 1941 and 1981 to produce such a significant shift in the representation of the architectural user? To understand this shift and its relation to access-knowledge, we must consider how these new figures materialized, what they represented, and why they appeared in *Graphic Standards* at this particular moment.

In the early twentieth century, the U.S. military employed industrial designers to create machines, vehicles, and uniforms, which they designed by drawing on the military's vast collections of anthropometric data about male soldiers' bodies. Influential American industrial designer Henry Dreyfuss continued to work in this capacity in the post–World War II era, bridging military and civilian applications of data with "human engineering," a new paradigm for creating products and tools by "designing for people."[44] This practice, later termed "ergonomics," merged the evidence base of military "human factors" research with the aesthetic and functional practices of industrial design.

While human engineering aimed to enable designers to create with users in mind, the practice was also, as its name suggests, involved in "configuring" the prototypical users of products and technologies.[45] Dreyfuss's development of human engineering reveals the surprising parallels between the projects of solidifying the normate template, in one sense, and unsettling it, in another. He recalls, for instance, the process of developing the first anthropometric drawings for use by industrial designers following World War II.

> Our office was working on the interior of a heavy tank for the Army. We had tacked a huge, life-size drawing of the tank driver's compartment on the wall. The driver's figure had been indicated with a thick black pencil line and we had been jotting odds and ends of dimensional data on him as we dug the data out of our files. Surrounded by arcs and rectangles, he looked something like one of the famous dimensional studies of Leonardo. Suddenly, it dawned on us that the drawing on the wall was more than a study of the tank driver's compartment: without being aware of it, we had been putting together a dimensional chart of the average adult American male.[46]

As this narrative unfolds, the user's body appears to materialize as if by magic. But the final form, an early prototype for the figure of "Joe," shares with Freese's figures its appearance of harmonic geometry, appended with dimensional notations. Dreyfuss invites the reader into this scene of discovery but quickly qualifies it by laying bare the firm's ad hoc research process. "Here and there," writes Dreyfuss,

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

> we found a book or article with some data we could use. . . . Many were old, out of print and probably inaccurate. . . . Over the years, our pile of books, pamphlets, clippings, and dog-eared index cards grew higher and more jumbled. When World War II came, the pile grew even faster. The armed forces and their suppliers undertook some very ambitious human engineering and published their findings. But still no one assembled these data into a single package that a designer could refer to and save spending days wading through his library and files.[47]

By scientific standards of the time, these research methods would have appeared disorganized, riddled with epistemological leaps, unlikely to yield a truthful representation of the user. But, as Dreyfuss illustrates, compiling research was an experiment in new ways of knowing-making: the process did not adopt a designerly view from nowhere or seek a one-to-one translation of data into form but rather injected a concept of "evidence" into fields of practice that were not necessarily wedded to an objective standard of truth. This position relative to more established sciences made human engineering a "switchpoint" at which new concepts, truth claims, and exercises of power could infiltrate the norms of design practice.[48] Dreyfuss's publication of *The Measure of Man* and its laying bare of the messiness of knowing-making animate the work of access-knowledge. Behind the scenes of major design projects and their final built form, access-knowledge was at work reconfiguring how designers make and know.

Joe came first, followed by Josephine.[49] The pair were intended as tools for "Tailoring the Product to Fit."[50] Alvin Tilley, a human factors specialist employed at Henry Dreyfuss Associates, completed the first iteration of the drawings in 1959 (Figure 1.7). They appeared the next year in a special issue of the journal *Industrial Design,* for which Dreyfuss wrote the introduction, and were followed that same year by *The Measure of Man,* a portfolio-style packet of dimensional drawings completed by two life-sized posters of Joe and Josephine.[51] Despite the portfolio's specialized use, however, Joe and Josephine were meant to appeal to a broader audience than industrial designers alone. In 1961 Dreyfuss appeared on television to promote the portfolio.[52] The images and data, though borrowed from military researchers and rehabilitation engineers, entered the mainstream. Joe and Josephine circulated as material-epistemic hybrids: generalized data, abstracted from other bodies, appeared alongside these line-drawn figures, who were in turn rendered as fleshy bodies through their appearance as life-sized drawings. This conflation of data and flesh took shape again when the portfolio was reprinted as a revised and expanded hardcover book in 1967. At Dreyfuss's insistence, the reprint displayed a "split human figure": half anthropometric normate diagram, half fleshy but normate man (Figure 1.8).

Dreyfuss's tank driver, and later Joe and Josephine, were objects, tools for designers to use. But they were also *enacted* through the ways that industrial designers synthesized various ways of knowing how bodies stand, sit, crawl, work, breathe, and feel.

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

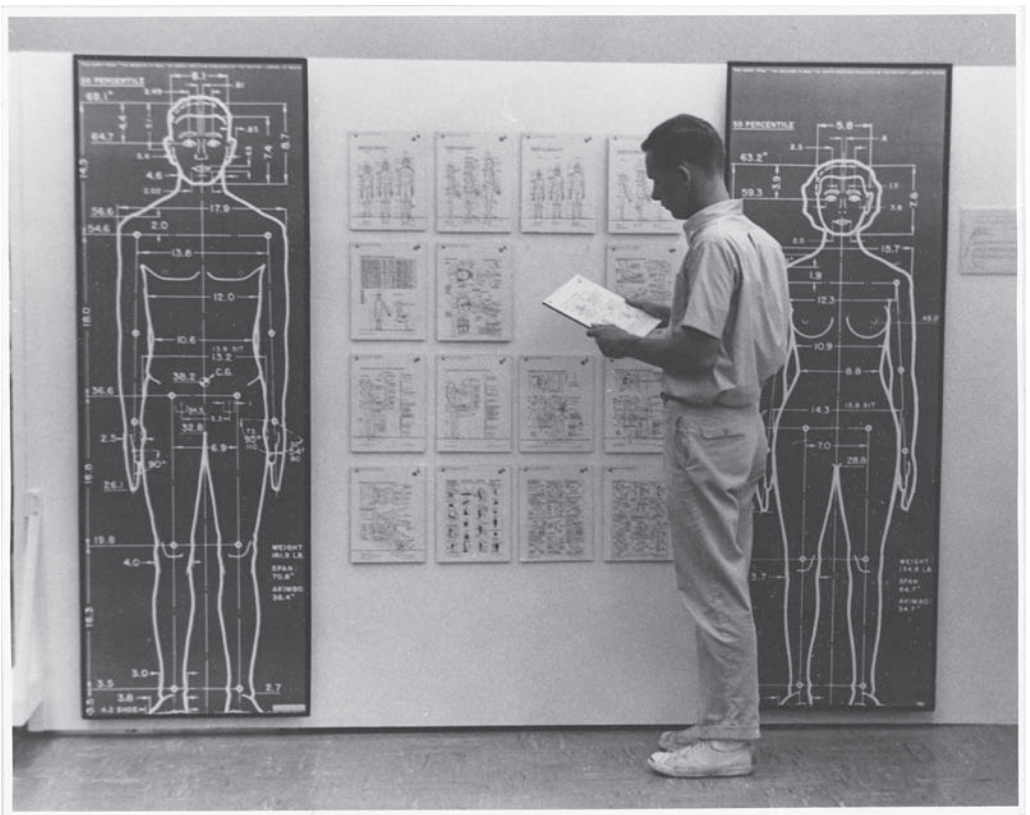


Figure 1.7. Real and imagined bodies: researcher Alvin Tilley stands before life-sized drawings of Joe and Josephine (ca. 1973). Courtesy of Cooper Hewitt, Smithsonian Design Museum / Art Resource, NY.

Joe and Josephine joined the scientific efforts of industry, medicine, and war into singular, legible configurations—arrangements that industrial designers could imagine as (and use to predict) an enfleshed, living user and employ as points of departure for investigating more particular users. Dreyfuss's accounts of these enactments, quoted above, were laid out in the introduction to the second edition of *The Measure of Man,* published in 1967.

Data provided inside the portfolio reflects several decades of ergonomics and human factors research in military design, factory engineering, fashion, psychology, and other fields for which statistical data could provide useful population-scale generalizations in an era of mass production.[53] Compared to Modernists touting standardization, however, the human engineering approach to industrial design emphasized the dynamic nature of human users and consumers. This was exemplified in Henry Dreyfuss Associates' firm motto: "We bear in mind that the object being worked on is going to be ridden in, sat upon, looked at, talked into, activated, operated, or in

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

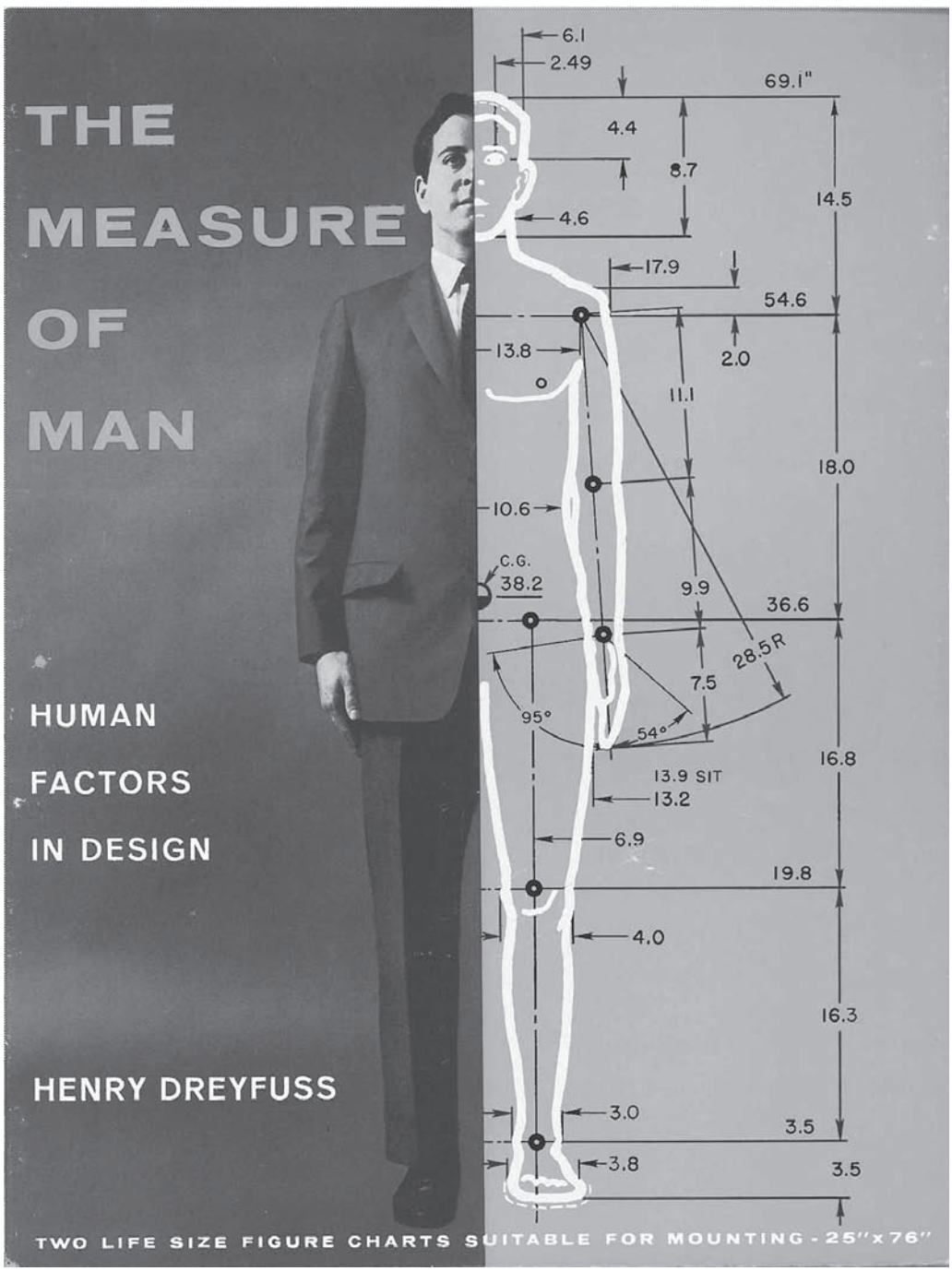



Figure 1.8. Revised edition cover of Henry Dreyfuss, *The Measure of Man: Human Factors in Design* (1967).

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

some other way used by people."[54] Designing for users was thus contingent upon knowing and predicting a multiplicity of uses, even for a single product. Far more than a data repository, *The Measure of Man* shaped user-centered design as a formal methodology—a tangible integration of knowing-making—that designers could employ in the service of more usable products. The imperative to design with users in mind served as a material and methodological critique of Modernist design principles, particularly their flattening of human users and failures to address human use.

A discourse arose within the design professions, likely in converse with the rise of social protest movements in the 1960s, to challenge the primacy of singular normate representations of the user. In the revised *Measure of Man* (1967), published amid the passage of major civil rights legislation for disabled people and people of color, Dreyfuss's description of Joe and Josephine addressed the normate template as a habit of perception.

> The published drawings included the dimensions of the small, average and large men, but only the average man was drawn. We found that people referred to the charts as "Dreyfuss' average man," which indicated that many people had misunderstood the diagrams and probably misused them. A good design must "fit" not only the theoretical average, but his large and small brothers. We had thought this was obvious in the charts, but we seemed to be wrong.[55]

Dreyfuss was aware that normate figures representing statistical averages were often taken as real bodies. Despite shifts in the content of statistical data, designers had continued to imagine the average body through a default habit of perception. But for Dreyfuss, the standard of the prototypical user was moving in another direction: away from the normate body and toward one that appears (in his description) nonnormate, even disabled.

Joe and Josephine, Dreyfuss claimed, have "numerous allergies, inhibitions, and obsessions. They react strongly to touch that is uncomfortable or unnatural; they are disturbed by glaring or insufficient light and by offensive coloring; they are sensitive to noise, and they shrink from disagreeable odor."[56] By Dreyfuss's account, Joe and Josephine's ways of being resemble symptoms of certain types of cognitive disabilities, such as autism or sensory processing disorders. These diagnostic categories, however, would not exist until the 1990s.[57] Nor was Dreyfuss apparently aware of the deinstitutionalization movement, which sought to transition mentally disabled people from institutions to community-based care. Although Dreyfuss appeared to understand Joe and Josephine's traits as statistically atypical, his attribution of these standards of human cognition for designers was central to devising a theory of good design as premised on the most nonnormate, misfit, and vulnerable bodies.

Yet Joe and Josephine's "allergies, inhibitions, and obsessions" were not necessarily atypical to the population, nor were they born of disability rights or social justice

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

discourses. Instead, Joe and Josephine's described sensory characteristics reflected industrial designers' preoccupations with mechanical danger, chemical and thermal vulnerability, and sensory overwhelm in an era of Cold War science. Because Dreyfuss drew on available data from military and industrial sources and had begun his inquiries into body-environment interactions through military contracts, he had at his disposal a set of practices relating to engineering the user's safety, limiting exposures to mechanical vibrations, sounds, lights, and chemical exposures. A diagram of "Environmental Tolerance Zones" in *The Measure of Man* showed a human body viewed from above, at the center of concentric circles delineating degrees of environmental comfort in relation to atomic radiation, atmospheric pressure, heat, acceleration, carbon monoxide, and shock waves.[58] Notions of interface safety, in turn, informed human engineering as a vulnerability-mitigating method and set the baseline of good design according to military-industrial notions of the body.[59]

Despite attention to these sensorial dimensions of the human body, however, the primacy of dimensions and scale endured in the firm's new projects. Beginning in 1974, two years after Dreyfuss's death, Henry Dreyfuss Associates' Niels Diffrient, Alvin Tilley, and Joan Bardagjy published a series of portfolios titled *Humanscale* that incorporated newly available anthropometric, anthropological, human factors, and medical data on women, children, elders, and wheelchair users.[60] Although apparently marketed toward industrial designers, the new data and diagrams began to cross into the realm of architecture. In the early 1980s, legal requirements for accessible architectural design, particularly wheelchair users, had become enforceable in the design of federal buildings, increasing the urgency of a more inclusive knowledge base for architects.[61] Accessibility standards defined specific desirable outcomes in the built environment, such as the ideal slope of a wheelchair ramp. Disabled architect Ronald Mace had developed illustrated depictions of such codes.[62] Yet *Graphic Standards* turned to *Humanscale 4/5/6* (published in 1981) for its new diagrams of the human user, including the disabled user.[63] Although the new accessibility codes focused on disability (and not explicitly gender or age), the 1981 (seventh) edition of *Graphic Standards* replaced Freese's dimensional figures of the universal man and feminine shoe with an array of newly legible figures, including Joe, Josephine, a child, a wheelchair user, and a person using crutches—all depicted as white, featureless figures (see Figures 1.5 and 1.6).

These intertextualities suggest that in the twentieth-century project of access-knowledge, designing with particular types of users in mind entailed intersecting disciplinary and professional approaches to knowing, as well as making. One detail deserves reiterating: the legal impetus for disability access (code-based requirements that took hold in 1980) led to a wholesale diversification in *Graphic Standards* of the figures of the architectural inhabitant, an expansion of gender representation, as well as disability inclusion. Disability inclusion, in other words, enabled inclusion for a wide range of bodies. This was not because accessible features for wheelchair users,

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

for instance, would be beneficial to the other users depicted but because the legibility of disability in the twentieth century was fundamentally entangled with the structures of knowledge governing legible human variation. Why the legal impetus for disability access led to such an expansion of representation, and how this relates to the growing intersections of industrial, scientific, and architectural knowledge, are explored in the next two chapters.

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.

*This page intentionally left blank*

Copyright © 2017. University of Minnesota Press. All rights reserved.

Hamraie, Aimi. Building Access : Universal Design and the Politics of Disability, University of Minnesota Press, 2017. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/upenn-ebooks/detail.action?docID=5087795.
Created from upenn-ebooks on 2026-08-26 15:41:48.