The replacement of geography by standards and what to do about it

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ABSTRACT

Anthropometry has historically involved "men of science" carefully measuring and noting down the dimensions of human bodies. Anthropometry is invoked to emphasize the importance of measuring the world at human scale, to achieve better economies of scale in making human-sized objects, and to make arguments and predictions about ideal states of humanity. This paper presents two projects that parse relationships between human bodies and measurement. *Scanning Hands* explores low-end 3D scanning as a probe and catalyst for discussion of the history of anthropometry as it relates to current 3D scanning practices. *Non-Standard Bodies*, an interactive wearable sculpture, tackles the imposition of remote standards on individual bodies. The goals of this paper are twofold: to explore systems of body measurement and their often-ignored ramifications; and to introduce an idea, the replacement of geography by standards, as a way of positioning and generalizing such measurement activities.

KEYWORDS

Measurement; geography; standards; bodies; digitization; anthropometry; 3D scanning.

1 | INTRODUCTION

In Neal Stephenson's 1992 novel *Snow Crash*, franchises like White Columns and Mr. Lee's Greater Hong Kong fill the functions we might expect to see carried out by states. Termed "Franchise-Organized Quasi-National Entities" (FOQNEs), these organizations are half residential subdivision, half nation-state, offering and enforcing services and regulations. Potential customers or nationals choose which FOQNE to opt into and do business with. The FOQNEs are not concentrated in any particular locale, operating around the world. If you belong to Mr. Lee's Greater Hong Kong, its franchises will welcome you, regardless of your geographical location. Stephenson describes the highly-formalized functioning of the FOQNEs, each one governed by its own book of franchise rules, an operating manual which determines how all situations and actions should be handled. The fictional Franchise-Organized Quasi-National Entities are one particular kind of logical extension to a real-life anxiety: the formulaic and formal nature of globalized life. Whether in the form of restaurants, hotels, clothing retailers or myriad other categories, the promise of consistency across distance is one which has provided us with a potent and rich source of stories and anxiety. Less obvious,

however, are the underlying standards and infrastructures that make such global sameness possible. This paper tackles one particular kind of global standard: the measurement of human bodies.

In the late-19th century and the beginning of the 20th, detailed scientific measurement of human bodies was in vogue. This science was called anthropometry. For psychological assessment, to determine fitness for work, and to organize humanity into strata, “men of science”[1] carefully measured and noted down the dimensions of so many human bodies. Today, the work of anthropometric measurement is invoked, at turns, to emphasize the importance of measuring the world at human scale (Tavernor, 2007), to achieve better economies of scale in making human-sized consumer goods (like clothing, chairs and workspaces as in the ANSUR series of anthropometric data collection initiatives organized by the American military), and to make arguments and predictions about ideal states of humanity (World Health Organization childhood growth charts, for example). When invoked in practice, the collection of anthropometric data is positioned as positive, providing value to both those who are measured and those who are collecting or making use of the measurements. However, as with any exercise in data collection and organization, the collapsing of individuals into standard categories presents problems. To that end, this paper has two specific goals: to explore systems of body measurement and their often-ignored ramifications; and to introduce an idea, the replacement of geography by standards, as a way of positioning and generalizing such measurement activities.

Advancing through a short review of arguments around the historical measurement and codification of human bodies, this paper will briefly examine work on standards, both in general and as they relate to human bodies. In order to bring the issue into a clearer context, the story of two works executed by the author will be recounted and examined. The two works are used as examples of ways in which the measurement of human bodies can be discussed and troubled in public contexts. Finally, the two prevailing themes of the paper—body measurement and the global standardization of previously local objects—will be tied together by a discussion and elaboration of the ways in which formal standards work to replace local context, something that we will term “the replacement of geography by standards.”

2 | MEASURING BODIES

The relationship between bodies and measurement has changed over the centuries. From defining our units of measurement through their similarity to our body parts, we've moved to an opposite characterization: defining our bodies using standard systems of measurement. Tavernor (2007) argues that the move from imperial measures to metric has heralded a move from measurements with direct relation to the human body to measurements related to the earth. That a metre is defined as a proportion of the circumference of the globe, as measured in revolutionary France, is seen, by Tavernor, as evidence that we have ceased to consider the human as the basis of our measures. Tavernor suggests that, by divorcing our measurements from the human body, we begin to create a built world in which the human form is subordinated to abstract scientific ideals. Thus, we no longer use bodies to measure, but use abstract measures to understand bodies.

The use of abstract measures to understand our bodies is one that might be traced to our modernization. With a greater understanding of and commitment to science, we come to understand the functioning of our bodies in more rational ways, giving vogue to the idea that we can develop a model of what humans are: the standard human. Lengwiler (2009) suggests that we can trace the standard human, as a construct, back to the mid/late-19th century. The assumption is that before statistics (which Lengwiler ties to the development of the standard human), the concept of a standard human did not exist. The introduction of actuarial tables for insurance assessment imposed, Lengwiler argues, a definition of what a human should be. In its evolution, insurance coverage moves from non-standard (coverage determined at the discretion of a doctor) to a binary standard (either one is fit for insurance or one is not) to a gradated standard (different clients treated differently, based on a set of defined factors). Lowe describes something similar: anthropometrically-derived medical exams of American women at college in the late 19th century, which documented "the dimensions of healthy white American womanhood" (Lowe, 2003, p. 24). Lowe quotes a period account

from a college student, recounting that the medical examiner "made me feel like one of those dictionary pictures of a steer with the parts numbered for each measure she took down in a big ledger" (quoted on pages 24-25).

The insurance and health examples provided above are positively friendly when compared against body measurement in the service of social stratification: activities like the criminal anthropology of Francis Galton and Cesare Lombroso, using the measures of human faces to determine criminality, or Paul Broca's attempts to discover character through craniometry (Gould, 1996). Such assessments and attempts at categorization are, arguably, an early form of what has become a far more complex and nuanced practice, with the assistance of improved data sets, and with an improved ability to compile more exhaustive profiles of bodies and behaviours. We might even argue that systematic body measurement is an element of what Oscar Gandy calls the “panoptic sort,” a use of surveillance and data collection in the service of classification, resulting in “the assignment of individuals to conceptual groups on the basis of identifying information” (Gandy, 1993, p. 16). Such classification, Gandy argues, requires assessment, and is a case of the comparison of individuals against each other in order to determine norms. There is, however, a substantial difference between norms based on the relatively sparse data sets available in previous centuries and those discussed by Gandy.

Where older modes of body measurement relied on measures of weight and the dimensions of particular parts of the body, we now see a move to a far more detailed set of measures. We begin to see the adoption of body scanning, an activity which makes use of a collection of different imaging technologies, including optical capture based on cameras, backscatter x-rays, and millimetre wave scanners—scanners which bounce invisible waves off of objects in order to image them, to produce high-detail images of human bodies. Body scanning is carried out in a variety of contexts, with perhaps the best known being in security screenings at airports. Such scanning is also being used for purposes of data collection and standardization, national security, and consumer satisfaction. In the case of data collection, a number of initiatives in the last fifteen years have made use of body scanners for purposes of both demography and the improvement of consumer goods. SizeUSA and SizeUK, commercial initiatives organized to gather up-to-date information about body proportions in the populations of the United States and the United Kingdom, respectively, have benefited consortia of clothing manufacturers seeking to more closely match their goods to current body shapes (Bye, LaBat & DeLong, 2006). Alternately, the previously mentioned ANSUR initiatives, in which the most recent edition, ANSUR II, uses body scanning technology to measure a representative sample of military personnel, exist to improve the ergonomics of both clothing and other body-sized goods used by the armed forced of the United States (Paquette, 2011). In security applications, body-scanning technologies are being used to supplement or supplant metal detectors in venues such as airports. Less pervasive, and shorter-lived experiments have even offered the option of using 3D body scanners to customize products like jeans (Bye, LaBat & DeLong, 2006).

While all of the above uses of 3D scanning are carefully positioned as beneficial, criticism of the increasing collection of body data does accompany any deployment of non-voluntary scanning, as in the case of body scanners at airports. Most often, this criticism is founded in concerns that those viewing the scans will behave pruriently. Of more interest here, however, is the contribution that scans, whether voluntary or non, could make to our data doubles, the shadows of ourselves represented by data collected about us and stored in databases. Poster refers to personal data stored in databases as “the constitution of an additional self, one that may be acted upon to the detriment of the 'real' self without the 'real' self ever being aware of what is happening” (Poster, 1990, pp. 97-98). The additional selves Poster refers to, however, are selves of the time in which he was writing: credit card transactions, textual information about our preferences, our birth dates, our magazine subscriptions. 3D scanning offers the possibility of an even more complete data double, one which embodies not just our habits, tastes and financial transactions, but potentially a history of our very bodies, longitudinally representing and tracking our changes, landmarked by our trips through scanners.

Because of the increasing precision and continued ubiquity of mass measurement, much of my work in

the last three years has focused on the measurement of human bodies and the implications of those measurements. In this paper, I present two projects that explore different aspects of the relationships between human bodies and measurement. *Non-Standard Bodies* (with Mike Tissenbaum), an electronic wearable sculpture, tackles the imposition of remote standards on individual bodies. A more recent project, operating under the working title *Scanning Hands*, is an exploration of low-end 3D scanning. In scanning body parts, and in organizing workshops in which others scan their own body parts, I aim to embody the history of anthropometry and relate it to current anthropometric practices involving 3D scanning. The two works, taken together, form the beginning of a corpus of projects that seek to make visible the common underlying practices of body measurement and their often-ignored ramifications.

3 | A BRIEF WORD ON STANDARDS

This paper frequently invokes the term "standards," a word that has been multiply and variously defined in a variety of different disciplines. For example, in describing a standard for the normal growth of children, Butte, Garza and de Onis (2007, p. 154) explain a standard as something that defines "a recommended pattern of growth that has been associated empirically with specified health outcomes and the minimization of long-term risks of disease". They contrast this against a reference, something that collects and renders statistically useful a set of data from real life. In a different kind of utilitarian turn, the International Organization for Standardization, ISO, describes their standards as documents that "give state of the art specifications for products, services and good practice, helping to make industry more efficient and effective. Developed through global consensus, they help to break down barriers to international trade" (ISO, n.d.). The Oxford English Dictionary gives us a baffling collection of definitions for the word "standard," encompassing commerce, horticulture, warfare, and sport, among others (Oxford English Dictionary, 2014). Crucially, however, it offers "Exemplar of measure or weight," and "An authoritative or recognized exemplar of correctness, perfection, or some definite degree of any quality" (ibid). Standards are highly contextually dependent.

An increasing body of literature situated within the social sciences attempts to provide a framework within which to view standards. Lampland and Star (2009, p. 5) give five characteristics to standards, namely that they are "nested inside one another[;]... distributed unevenly across the sociocultural landscape[;]... relative to communities of practice[;]... increasingly linked to and integrated with one another across many organizations, nations, and technical systems[;]... [c]odify, embody, or prescribe ethics and values, often with great consequences for individuals". Lawrence Busch (2011, p. 10), in a book that explicitly seeks to understand the diversity of standards and their generalizable traits, describes standards as "always [incorporating] a metaphor or simile, either implicitly or explicitly". In this sense, Busch is describing standards as tools, objects and guides against which other objects can be compared. Busch gives the example of a standard weight, which "can only be used (properly) by comparing other weights that are used in everyday commerce to it" (2011, p. 11). Finally, O'Connell (1993), though he is not explicitly exploring standards, refers to them as imbued with meaning beyond their physical properties. In particular, he gives the highly evocative example of the physical standard which embodies the legal volt:

> *"Without the certificate specifying the true value of the battery and attesting to the time and circumstances of its calibration, the box would hold nothing but four rather ordinary, albeit weak, batteries that are of no use to anyone. With the certificate, the box still holds four batteries, but it also holds something else of far greater importance: it also holds the legal volt." (O'Connell, 1993, p. 148)*

This paper takes a view of standards that draws on many of the above definitions and uses. A standard, for our purposes here, is a set of procedures or rules that renders a practice explicit and transportable. Like O'Connell's volt, it may be embodied in an object. Or, like ISO's standards, it may come in the form of a document. Regardless of its shape, its function is to allow actors in diverse settings to achieve sameness in their activities.

4 | TWO EXPERIMENTS IN BODY MEASUREMENT

Scanning Hands is an ongoing series of events exploring both technical and social issues around new developments in 3D body scanning. It uses low-end 3D scanning as a probe and catalyst for discussion of the history of anthropometry as it relates to current 3D scanning practices. Using photogrammetric 3D scanning—a process which takes a collection of images of one object and interprets a 3D object from those images—participants in the workshop scan their own hands. One early implementation of the project uses my own hand as the example, with the hand and its digital representation on display. In order to make the hand less uniform and thus more visible to the software used to render the photos three dimensional, I draw lines of different colours on my hand. The lines follow the external contour of my hand, as well as the creases on my palm and joints. Not only does this process make the hand more visible to the photogrammetry software, it serves as a point of discussion with viewers, and an invocation of body measurement and marking common in medical and cosmetic practices. A visitor coming up to the display sees a 3D hand on the screen, and then its physical analogue, both covered in lines and numbers.

The purpose of *Scanning Hands* is to incite discussion about 3D scanning. As with many technologies currently moving to the mass market, 3D scanning has existed for some time, without consumer applications. As such, many people viewing *Scanning Hands* are encountering low-end 3D scanning for the first time. Their only previous experience with 3D scanning might well be with high end imaging techniques such as those used in medical applications (ultrasound and magnetic resonance imaging, for example) or in security applications (such as backscatter and millimetre wave scanners at airports). *Scanning Hands* uses the low end of 3D scanning technology to give ordinary citizens access to a technology that may be almost entirely alien to them. The message in the project is that if an individual can scan her own hand with only a digital camera and a piece of free software, more expensive and specialized 3D scanning technologies can do far more. The discussion catalyzed by this realization revolves around the ownership and use of such scans. Who is making our bodies digital? Whose cloud do they inhabit? Which server farm does your body live on?

Non-standard bodies is an interactive, wearable sculpture constructed in winter 2010. It tackles the imposition of remote standards on individual bodies. The sculpture is shaped like a dress, with voluminous fabric concealing a plastic crinoline. Mounted on the crinoline are several small motors, each controlling a different point on the dress. The action of the motors is controlled by the viewer, who manipulates a set of switches mounted onto the spine of the dress. Each switch governs a particular set of motors. One might change the length of the dress's skirt; another, the length of the sleeves. Anyone viewing the dress has the power to modify it, thus changing the fit and appearance of the dress, without the permission of the wearer. The wearer, by dint of the size of the dress and the positioning of the knobs, does not have the power to manipulate the dress herself.

As such, *Non-Standard Bodies* is a physically instantiated argument about who controls the way we display our bodies. Because our clothing is so fundamental to the way the world sees us, its style and fit is a crucial part of our self-construction. Mass produced clothing, by necessity, comes in a limited number of sizes. Within one clothing line, however, each size will represent same or similar proportions, scaled up or down accordingly. Those sizes fit an abstract person, a person with a particular set of measurements. Unfortunately, human bodies do not come in such standard sizes and same sets of proportions. Thus, a standard clothing shape, scaled to a set of numbered sizes, and then worn on a body that does not conform to the prescribed proportions, cuts an awkward figure. The definition at a distance of a standard body shape acts similarly to the controls in *Non-Standard Bodies*. An actor at a distance controls the fit of a garment on a wearer, with very little recourse on the part of the wearer. The wearer's choice becomes whether or not she will wear the garment, but not what shape the garment has.

Both *Scanning Hands* and *Non-Standard Bodies* make arguments about the standard handling of diverse human bodies. In *Scanning Hands*, the issue under scrutiny is the absorption of an individual body into a digital infrastructure through the intermediary of the scanning process. The individual human body is

represented by a digital point cloud or set of vertices. It is stored in computational infrastructure, controlled and protected to a greater or lesser degree by a government, a company, or some other agent. The local body, when digitized conforms to a set of abstract, globalized standards. In *Non-Standard Bodies*, the process is somewhat reversed: instead of a digitized body being absorbed into a standardized infrastructure, the local physical body has a globalized standard imposed on it. Through a garment that represents an ideal—or at least "normal"—body, the wearing of the garment by an individual becomes the physical evidence of a difference between the actual wearer and the idealized wearer. A decision based on global systems of fit and manufacturing logistics comes to be imposed on a local wearer, wherever she may be.

5 | THE REPLACEMENT OF GEOGRAPHY BY STANDARDS

The imposition of remote standards on bodies is an example of the replacement of geography by standards. Referring to the replacement of geography by standards is giving name to the assumption that physical objects can be the same from place to place, without physical reference or proximity, as long as we can create standards and information systems around those objects. In standardizing goods around the world, physical objects have proved to be comparatively hard to move around. Ideas have proved themselves to be much more portable. Standards and information systems allow us to effectively circumvent proximity.

To take a convenient example, if we look at something like lumber, were there not a standard, in every building project, the sourcing of lumber would be completely personal and contingent. Indeed, Linebaugh describes problems in 18th century British dockyards, preventing the off-site cutting of timber destined for shipbuilding:

> *"such a plan required close communication between the yards and the areas of forest supply, and accurate specifications for the required timbers. Neither circumstance existed: communication was made difficult by scattered sourced of supply that were as far apart as the Baltic and New Hampshire; and accurate specifications required a degree of standardization that did not yet exist."* *(Linebaugh , 1992, p. 382)*

The modern existence of a standard size of lumber (like a 4x4, for example) and the social and technological structures which make such a thing possible mean that a set of assumptions can be made about the nature and functionality of a piece of lumber. In that sense, standards form an infrastructure for the construction of physical systems.

Beyond non-human subjects like lumber, standards relate to bodies as well, as evidenced by the example above of *Non-Standard Bodies*. A common, if slightly imprecise, example can be found in shoe sizes. Most people know their own shoe size. We say to ourselves "I'm an 8" (or, for the European context, we might say "I'm a 38.5"). We say to salespeople in shoe stores "I need an 8." We have a relatively consistent standard for shoe sizes (with relatively stable conversions across national boundaries), with a set of assumptions about the reliability of that standard. A salesperson in a shoe store might say to us "This style runs about half a size big." The judgment that the style runs big is based on our understanding of graded shoe size as relatively fixed and consistent. Without the shoe size, we would be forced to choose our shoes by other means. We might choose to get shoes custom made. We might choose to wear sandals or clogs designed to fit all sizes of foot. The replacement of geography standards, in the case of shoes and feet, allows the producer of the shoe to exist and function at a distance from the ultimate wearer of the shoe. Indeed, the construction of a standard set of graded shoe sizes allows shoe manufacturers to avoid dealing personally and individually with their customers. Customers are standard.

If shoe sizes provide one example of the replacement of geography by standards in relation to human bodies, growth milestones and ideal measurements provide another. The World Health Organization publishes a set of tables detailing the healthy range of height for boys and girls of different ages. The tables are used to give doctors and other clinicians a standard by which to measure the health of the children under their care. The standard is, in part, based on reference data. A slew of studies back up the assertion that it is even possible to apply a standard of growth to children the world over (e.g.,

Eveleth & Tanner 1990; Butte, Garza & de Onis, 2007; Habicht et al, 1974). Thus, in implementing and comparing against such a standard, every individual child comes to be compared against an abstract standard developed on the basis of concrete data. Rather than making a local comparison of children to determine what appears to be normal in a particular setting, such a standard applies a global measure.

The replacement of geography by standards is an attempt to substitute clear, explicit rules and guidelines for local, contingent, cultural norms. O'Connell (1993, p. 163), describing the need for precise specifications, states that "[w]hen a bomb made in Massachusetts, a bomber made in California, and a bomber pilot trained in Colorado are brought together for the first time in Panama and expected to fight a war, they must fit together as if they had not been formed in separate local contexts". An attempt is made to achieve a level of precision that allows parts and participants from different geographical areas to function seamlessly together at their destination. In support of this idea, O'Connell discusses the circulation of particulars, which may be practices, definitions, or even physical objects like the legal volt. Similarly, Latour (1986, p. 7) describes the concept of the immutable mobile, suggesting that "[i]f you wish to go out of *your* way and come back heavily equipped so as to force others to go out of *their* ways, the main problem to solve is that of *mobilization*. You have to go and to come back *with* the 'things' if your moves are not to be wasted. But the 'things' have to be able to withstand the return trip without withering away". Latour further goes on to suggest that, when attempting to translate knowledge, one must "invent objects which have the properties of being *mobile* but also *immutable, presentable, readable* and *combinable* with one another" (Latour, 1986, p. 7). In short, one must make immutable mobiles. Law further describes Latour's immutable mobiles as people, texts, "devices and technologies which also hold their structure as they are shipped from one location to another. The suggestion is that these then get embedded in, and tend to have patterning effects on, other sites of practice" (Latour, 2009, p. 8). Both O'Connell's particulars and the two descriptions of Latour's immutable mobiles are attempts at transporting rules, practices and interoperability from place to place, through the use of standards.

Busch (2011) describes standards as crucial in the project of modernity. Prior to the current system of standards based on documents, technical or procedural know-how existed embodied in people and places. Braverman (1974, p. 133) refers to the pre-1824 prohibition on British mechanics working abroad, describing the craftsman as a "repository of the technical knowledge of the production process". Sennett (2008, p. 84) calls that particular move, from embodied knowledge of steam engines, to blueprint-based knowledge, "a movement from hands-on knowledge to the dominant authority of explicit knowledge". The end result of such codification is the ability for knowledge to travel, not with its human knower-workers, but with documents produced by those knower-workers and implemented by potentially less knowledgeable workers. Though such an act may make knowledge more transferable, we might ultimately question what that transfer does to those implementing knowledge (to recall Stephenson, the managers of the FOQNEs, bound and governed by their rule books), as many students of the rationalization of labour have done. Haydu (1988, p. 38) suggests, for example, that "[s]cientific management developed for employers a set of standards and mechanisms of control to replace those of craftsmen" and that tasks and decisions which had previously been quite literally in the hands of skilled labourers became segregated and rarefied, given over to white collar planners and, from those planners, into codified, explicit documents.

Making knowledge portable without the transportation of its knowers (and, as such, at less expense and inconvenience) is one step. Another effect of the clear codification of knowledge is the ability to decentralize production. Scott describes the gun manufacturing quarter that developed in Birmingham in the 19th century. He refers to an extreme state of "vertical disintegration," resulting in master gun makers ordering parts from specialized suppliers, each producing one or few parts of the gun (Scott, 1988, p. 64). This disintegration needed close geography, for the transportation of parts, as well as the transportation of orders for parts. Scott refers to this configuration as being comprised of workshops "huddled close together in order to expedite the whole process of disintegrated but interconnected production" (Scott, 1988, p. 65). Though the downfall

of Birmingham's gun quarter was the implementation of American-style centralized mass production, other industries de-cluster for different reasons. In describing the garment industry in New York City, Scott explains the benefits of moving mass production out of the city, namely, cheaper labour on long runs of garments. With cheap transportation and portable, standardized methods, seeking out an advantage through reduced labour cost becomes feasible. Thus, with improved logistics for the transportation of goods and codified knowledge about production processes, the ecologies of production previously created in geographical areas by concentrations of knower-workers, can be reproduced along similar models elsewhere, in cheaper or more efficient circumstances. A standardized good can be produced through standard methods, to a standard specification, by a standardized worker.

That standardized worker, returning to one of the original arguments of this article, is both necessary to the construction of standardized goods, and fashioned by the same tools and methods which make such standard production practices possible. The standardization of human experience and skill, and the classifications of such skills, are crucial to practices of production and consumption which treat individuals interchangeably. Zuboff (1988) argues that one of the effects of rendering work less physically taxing has been to render it less skillful. But the removal of skill does not necessitate the removal of effort. Rather, as evidenced by advocates of scientific management, like Frederick Winslow Taylor or his predecessor, Samuel Bentham, the nature of physical labour may change little, though the decision-making process is put into the hands of a manager (Linebaugh, 1992). Such removal of planning into, first, the hands of a manager directly overseeing work, but later, as improved communication technology permits, into more centralized, farther removed quarters, displaces much of the unique skill of the worker, rendering them more standard and, as such, more easily replaced. As Zuboff (1988, p. 22) puts it, when less knowledge resides in the actual act of production, more room is left open “for the growth and development of the industrial bureaucracy, which has depended upon the rationalization and centralization of knowledge as the basis of control". Such control is reciprocal, constructed by systems of standardization of labour, but also constructing workers who are capable of fitting into the appropriate standards and meshing seamlessly into the production of standard goods.

Of course, the construction of standardized goods also requires the transportation of materials. Such a construction applies in the example provided by “Non-Standard Bodies,” which argues something akin to O'Connell's circulation of particulars like the volt, with individual garments representing a larger standard. When we move to processes that are less dependent on physical goods, however, concerns about such material logistics take a back seat. When a standard represents something largely immaterial, such as an action or a process, the circulation of the textual standard is all that is seen as required to achieve consistency across sites. As in the fictional example provided in the introduction to this paper, with nation-states formed on the basis of franchise manuals, entire systems spring up around standard procedure documents. These documents are, in effect, the immutable mobiles of global standardization. They are documents, representing procedures, which allow previously local practices to be transported. In the same way that routinizing the craftsman or knower-worker's knowledge makes it portable without him, routinizing practices which have previously been based in local understandings allows them to be transported beyond their original geographical bounds. This is how standards replace geographies.

6 | CONCLUSION

In both *Non-Standard Bodies* and *Scanning Hands*, the issue of local bodies caught up in global standards is raised. Our bodies are our most local ecosystems, with individualized practices and understandings. Enmeshing such small systems of knowing and doing in a global network of shared standards is an extreme example of the routinization of local practices in the service of global adoption. The interfaces between our bodies, our most individual locales, and the world of standard understandings and doings are battlegrounds in the adoption and dissemination of standard practices. As we increasingly replace individual or local geographies with shared standards, negotiating the boundaries between ourselves and our collective (but not always

collectively-controlled) rules and routines is of more and more importance.

Though frameworks for thinking about routinization, transportation of knowledge and, indeed, standardization, do exist, one of the contentions driving this article is that such frameworks often fail to take into account the impacts of globalized standardization on the embodied experience of those who find themselves navigating it. Rather than presenting an argument about the fact that knowledge and practices can be moved, this article takes for granted the fact that such a thing is being done, that ways of thinking about it do already exist, and that the next step is to begin conceptualizing ways of dealing with the effects which spring from such transportations of knowledge and practice. In effect, the arguments raised in this article are about how we can succeed or fail in maintaining nuance while making moves to global sameness or, at the very least, interoperability. Negotiating the balance between localized practices and globalized rules will require finesse and understanding, taking complex systems and making them approachable. *Non-Standard Bodies* and *Scanning Hands* are first attempts to bring a clearer understanding of such systems to affected individuals. Further approaches to problems of collapsed context need to be advanced, the situated needs of individuals and groups must be respected and included and, indeed, we must consider what can be done to both preserve the benefits and mitigate the harms caused in replacing geographies with standards.

ENDNOTES

[1] The phrase “men of science” is used here with a sense of irony and self-awareness, given that most of the influential practitioners of anthropometry and other sciences were men, but also given the heroism that has often been attributed to the endeavours and discoveries of such “men of science.” See, for example, Mary Terrall's “Heroic Narratives of Quest and Discovery” (1998).

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