Ab Condita

by

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in fulfilment of the
thesis requirement for the degree of
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Author's Declaration

I hereby declare that I am the sole author of this thesis.
This is a true copy of the thesis, including any required
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I understand that my thesis may be made electronically
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Abstract

Time and structure;
expectation and construction;
landscape and architecture;
history and myth.

The foundation is a joint which carries extraordinary potential to speak of the cultures that built it.

This text tells stories about three cultures whose identities are interwoven with their foundation-building. Tracing a path among the distinct ways in which they found, it values the foundation as a marker between anticipating and making in the architectural process; an ambiguous joint between land and building; an invisible structure of the surfaces we touch; and an indicator of an attitude towards time.

The narrative begins in Rome and concludes in the James Bay Lowlands of Northern Canada. Both indigenous cultures represent extremes in notions of 'foundation': Rome's tufa block substructures have borne buildings stratified over millennia; while the subarctic Omushkego Cree have traditionally had no permanent foundations, their building traces perceived in subtle differences of soil composition. A third base in the Netherlands is both a fulcrum and foil, as the nation's diverse local and large-scale strategies negotiate heavy and light building traditions, and offer another distinct set of considerations in preparing ground.

The aim of this book is two-fold. Firstly, it is to restore the foundation to the purview of the architect. Groundwork is more than a technical puzzle: it is also a deeply imaginative act. Secondly, this text seeks to understand why cultures found the way they do, and to give consideration to the unique inheritances offered by diverse foundation-building traditions.

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To my mother and father,
who taught me to write and build,
and to my grandparents.

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Foundation I

Time and structure;
expectation and construction;
landscape and architecture;
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This text tells stories about three cultures whose identities are interwoven with their foundation-building. Tracing a path among the distinct ways in which they found, it values the foundation as a marker between anticipating and making in the architectural process; an ambiguous joint between land and building; an invisible structure of the surfaces we touch; and an indicator of an attitude towards time.

The narrative begins in Rome and concludes in the James Bay Lowlands of Northern Canada. Both indigenous cultures represent extremes in notions of 'foundation': Rome's tufa block substructures have borne buildings stratified over millennia; while the subarctic Omushkego Cree have traditionally had no permanent foundations, their building traces perceived in subtle differences of soil composition. A third base in the Netherlands is both a fulcrum and foil, as the nation's diverse local and large-scale strategies negotiate heavy and light building traditions, and offer another distinct set of considerations in preparing ground.

Each foundation narrative introduces a generation, a dimension, and an inheritance.

During the Age of Augustus in Rome, the calendar—and arguably time itself—is reconceived and recalibrated in relation to the foundation of the city. The rhetoric of poets inspires and compliments a building tradition. Writers locate the foundation of the city in the depths of historical record, even as builders contrive techniques and devices to found deeply, lavishing attention on buried substructures. Similarly, literature explores the cyclical nature of time and human experience as the city itself is continually rebuilt. Rome's inheritance is endless material, literary and physical, perpetually refounded.

Johannes Hudde, mathematician and *burgemeester* (mayor) of Amsterdam through much of the Republic's Golden Age, makes visible the role of elevation throughout the history of construction in the Netherlands. The mystery and apprehension of constructing at the level of the sea have influenced a collective imagination, but uncertainty in foundation-building has also had tactile bearing on city surfaces and social structures. Small tolerances for flooding and subsidence have required regular maintenance over generations. Inhabitants of the Netherlands inherit labour: their continual engagement with waterland demonstrates the potential of reinvented groundwork to influence and transform environments above grade.

The Omushkego Cree of the James Bay Lowlands have altered their foundations most profoundly, transforming from a nomadic to a settled culture. Cree today continue to demonstrate creativity in reconceiving of ways of life in the advent of new technologies, new pressures and newcomers. The critical dimension of their foundation-building is latitude. This is not the measured northern latitude associated with high shipping costs and logistical difficulties, but rather the immeasurable openness of their land and their adaptability in living upon it. They remain perceptive to the land's nuance and possibilities, indicating that the way they choose to live and build on the land in the future remains open-ended.

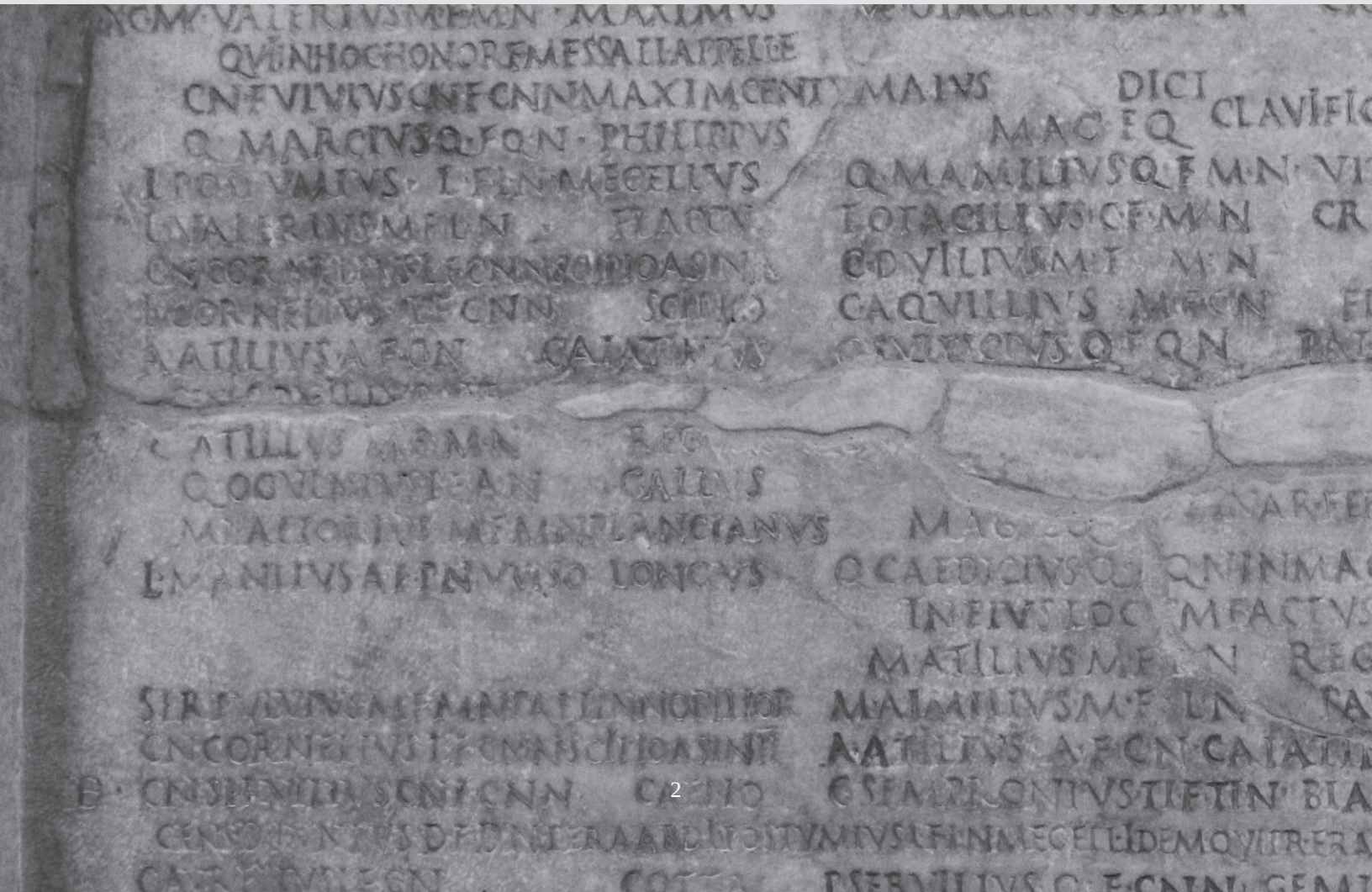
The aim of this book is two-fold. Firstly, it is to restore the foundation to the purview of the architect. Groundwork is more than a technical puzzle, but also a deeply imaginative act, laden with associations, meaning, and potential. Secondly, this text seeks to understand why cultures found the way they do, and to give consideration to the unique inheritances offered by diverse foundation-building traditions.

Rome

Time and Material

Figure 1

Detail of the *fasti Capitolini*, erected by Augustus in the Forum, re-assembled by Michaelangelo on Capitoline Hill. Shown below are the *fasti consulares*.



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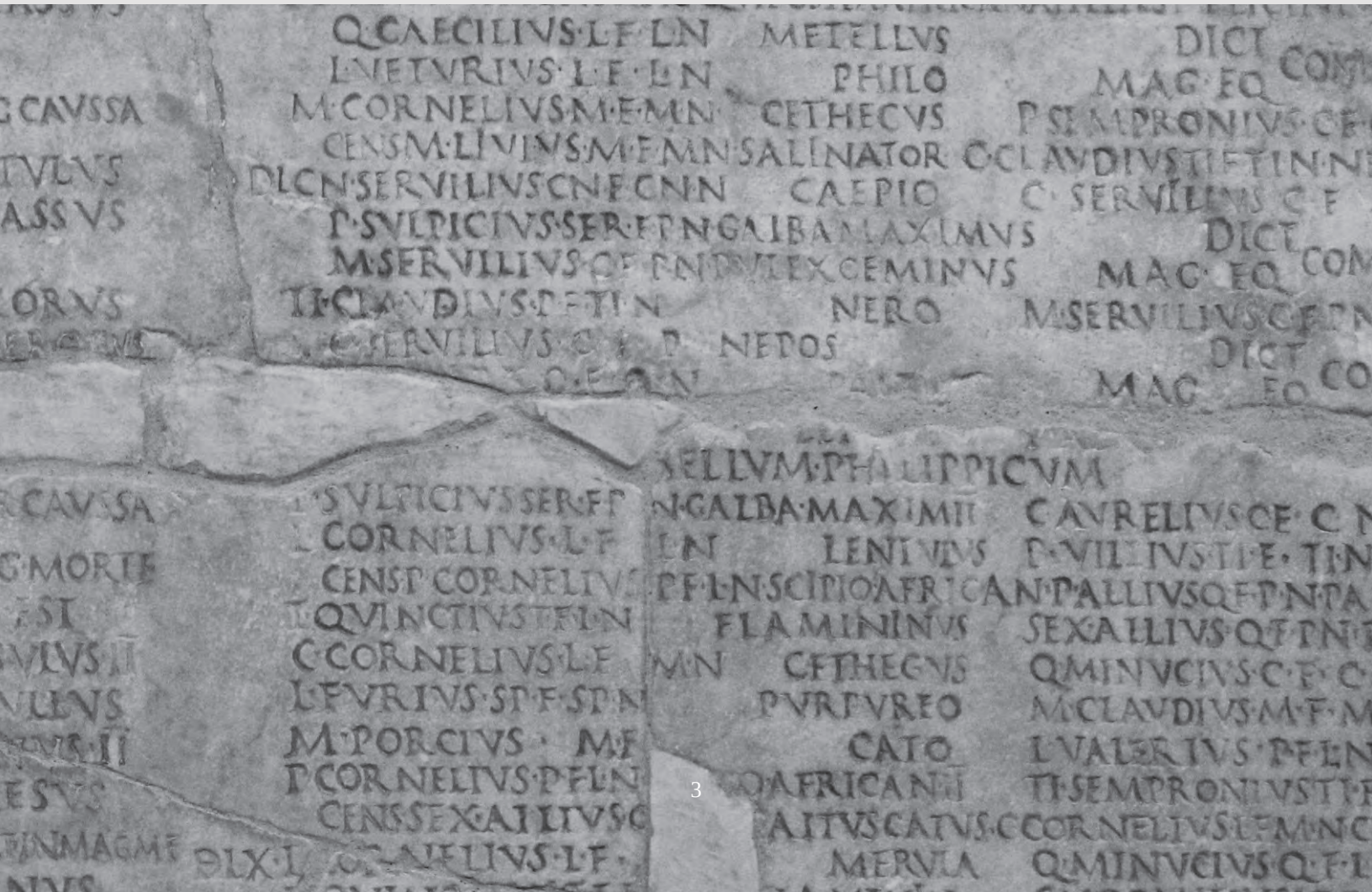

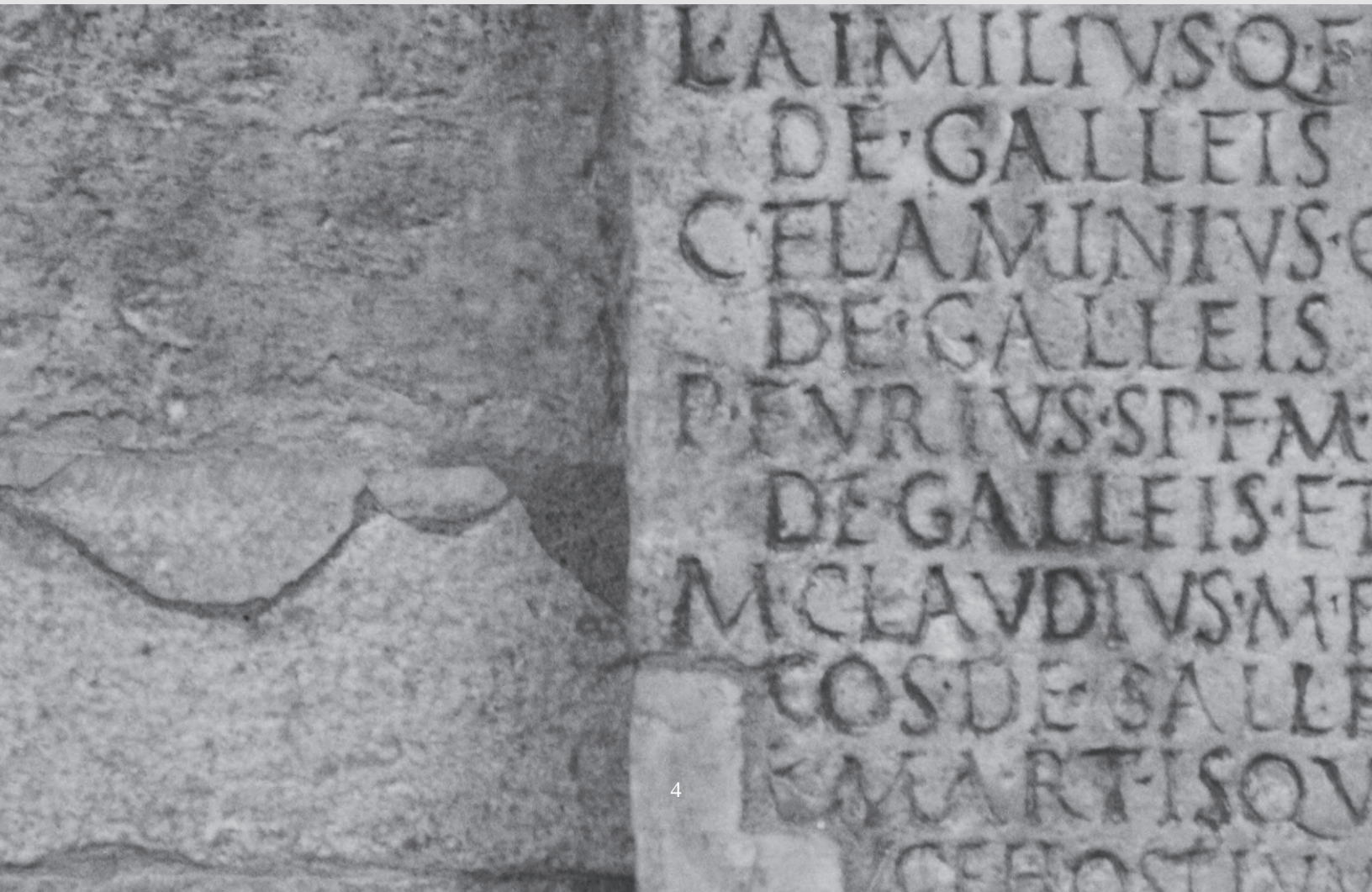
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We look to the *fasti* to initiate the story of foundations in Rome.

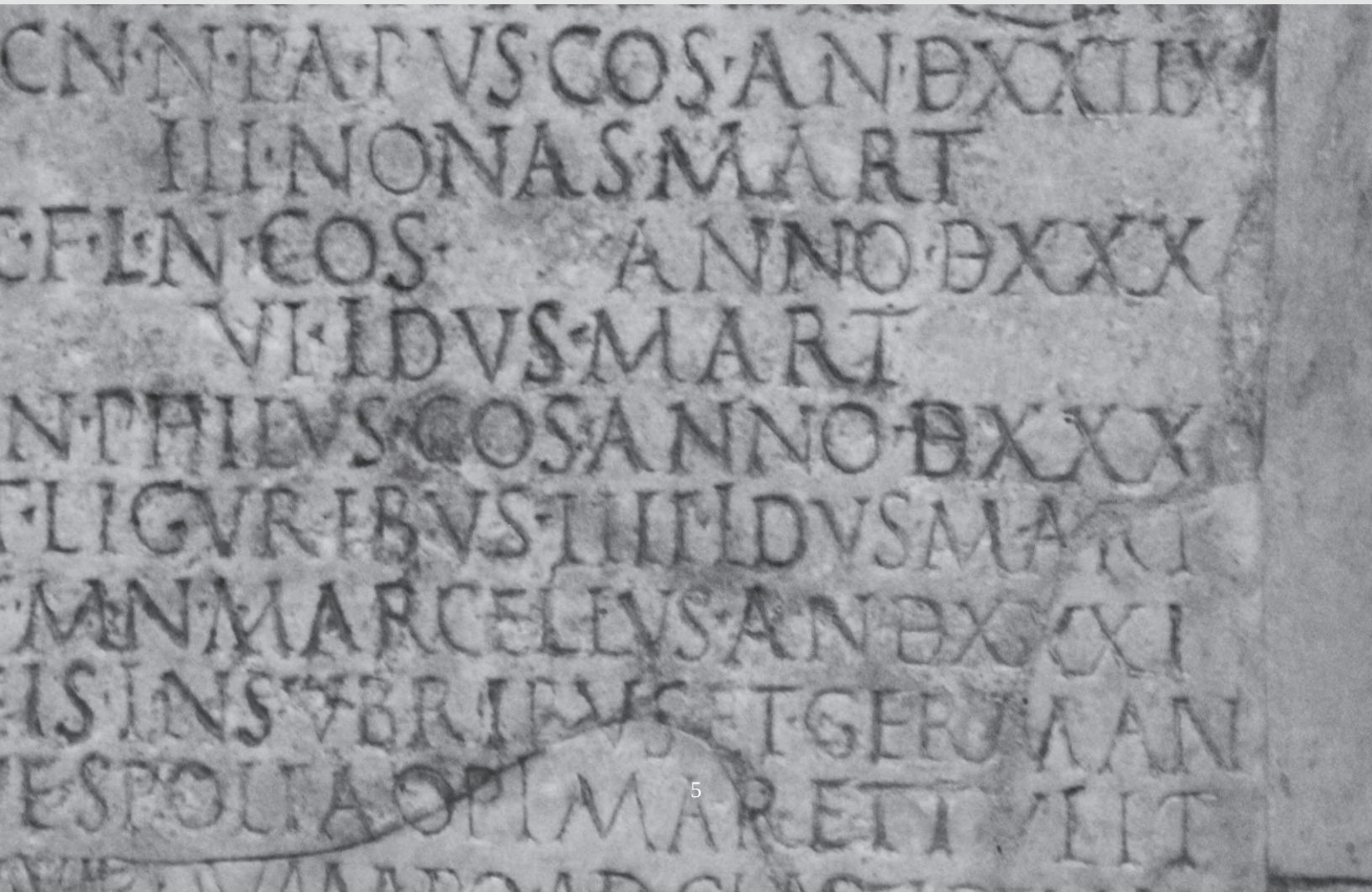
That is to say, we begin with a calendar, and, in particular, a period of its radical change. A culture reveals itself in the instruments by which it reckons time, and Roman identity especially is entrenched in the complex mechanisms of its time structures.

The Roman *fasti* calendar consisted of two interdependent time charts: one to plot the day of the year, and one to identify the year itself. The original *fasti* were religious records, identifying which days were *fas*, or 'permitted by divine edict' for transactions,[1] and were credited by Livy to the earliest days of Rome's foundation under King Numa.[2]

Beginning in the late second century BCE, however, the calendar swelled with annotations and associations with sacred and historic events. The recurring *fasti anni* incorporated feast days for the divinities,[3] days for games,[4] and key memorial dates.[5] The *fasti consulares*, meanwhile, noted the names of the two consuls elected each year. While the *fasti anni* marked the cyclical time of the year, the *fasti consulares* may be understood to record the linear flow of time, honouring the Consuls by counting the years according to their succession.[6] The *fasti* thus became not only a religious register for the future, but also a powerfully symbolic commemoration of the past.

Despite these accretions, the basic structure of the sacred time charts was apparently immune from interference up until the end of the Republic. Julius Caesar was the first to

Figure 2
Detail of the *fasti triumphales*

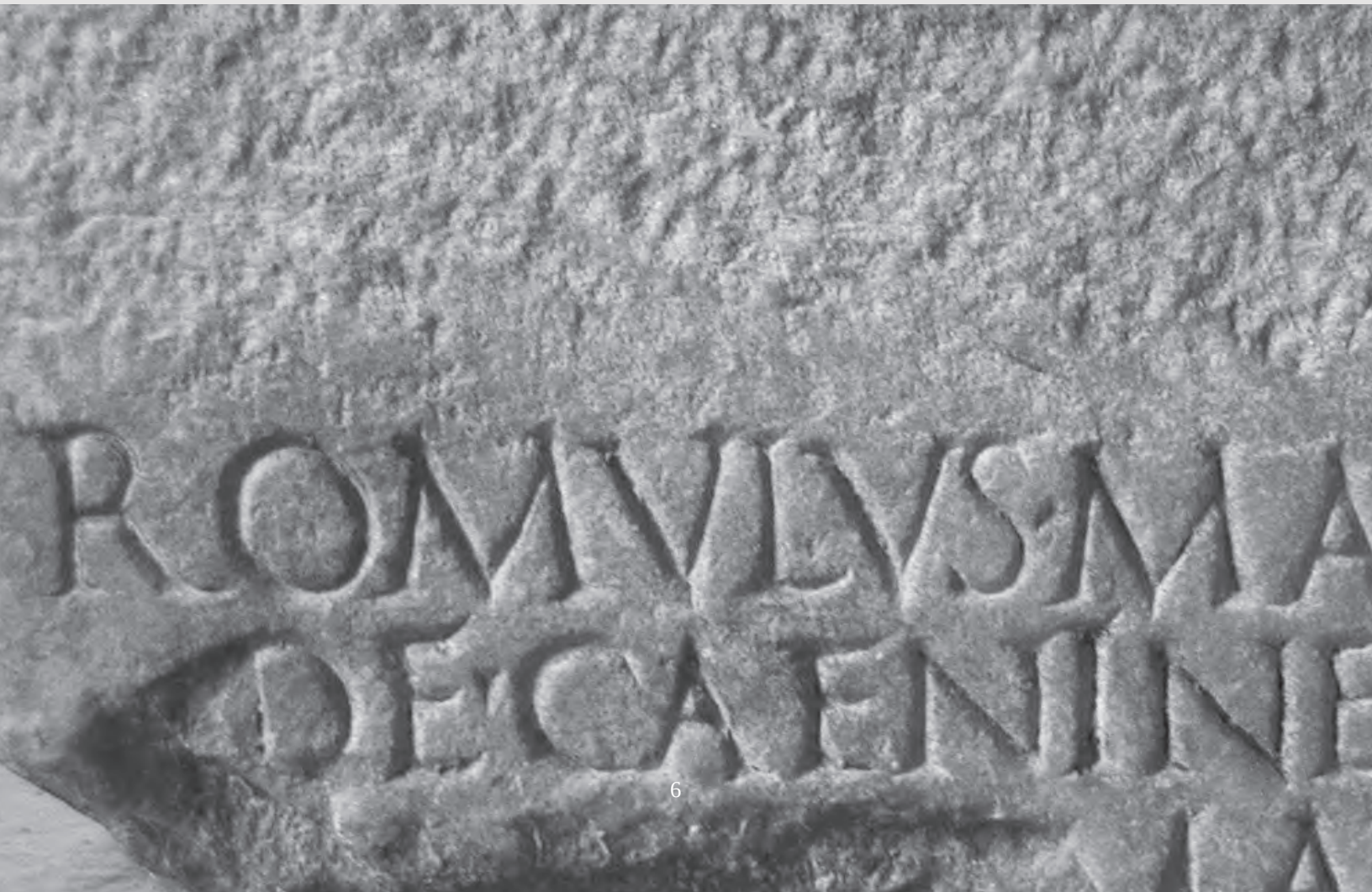


dare to recast the calendar. Perhaps influenced by his exposure in Egypt, he regularized the *fasti* and harmonized it with the solar year, creating an unprecedented and phenomenally consistent synchronism of natural and civil time.

Caesar's contemporaries immediately understood the implications of this power, seemingly at the scale of—and over—nature. Four days after the calendar's introduction, Plutarch records Cicero's rejoinder to the remark that the constellation of the Lyre would be rising the next day: "Yes, by decree."[7] The quip perceives the tremendous power of the calendar and its author, presaging a new era of regulation and systematization in the state that seemed to encompass even the diversity of the natural world.

Caesar's heir, Octavian, inherited this lesson in the power of calendar-making along with Julius' political fortune. Defeating Cleopatra and Anthony and adopting the name Augustus in 27 BCE, the ambitious leader steadily converted the Republic into a framework under his sole rule, acquiring supreme military command and the powers of tribune and censor for life. Time, however, continued to be measured according to the eponymous succession of consuls, unacceptably undermining Augustus' autocratic power by giving symbolic prominence to this inferior rank. To alter power structures would have been unthinkable in Augustus' subtle political program, which relied on maintaining the outward façade of the free republic while reworking its underlying structure. Instead, the Princeps employed indirect action on the second part of the calendar, left untouched by his adopted father.

Near the Temple Julius in the Forum, on the walls of the Regia[8] or perhaps his own



Triumphal Arch,[9] Augustus erected consular *fasti*, ostensibly to honour the consuls in the Republican tradition. However, this installation was to profoundly reorient the way that the public perceived civil time, using one small innovation. To the left of the columns of names, every ten lines, Augustus added the number of years from the foundation of the city: *Ab Urbe Condita*. [10]

Suddenly the calendar was charged with a second concept of time. While the consular names implied that the history of the city was bound by the existence of the consulship (and by extension, the Republic), the dates *ab urbe condita* relegated the period of the Republic to larger narrative that extended back to the time of the Etruscan kings. To expound the point, near the consular *fasti* Augustus included a new type of list, the so-called *fasti triumphales*,[11] which recorded the names of triumphant generals, starting with Rome's mythical founder Romulus. The triumphal list was annotated with *a.u.c.* dating only, compelling the reader to use the new system to locate the triumphal events in history.[12]

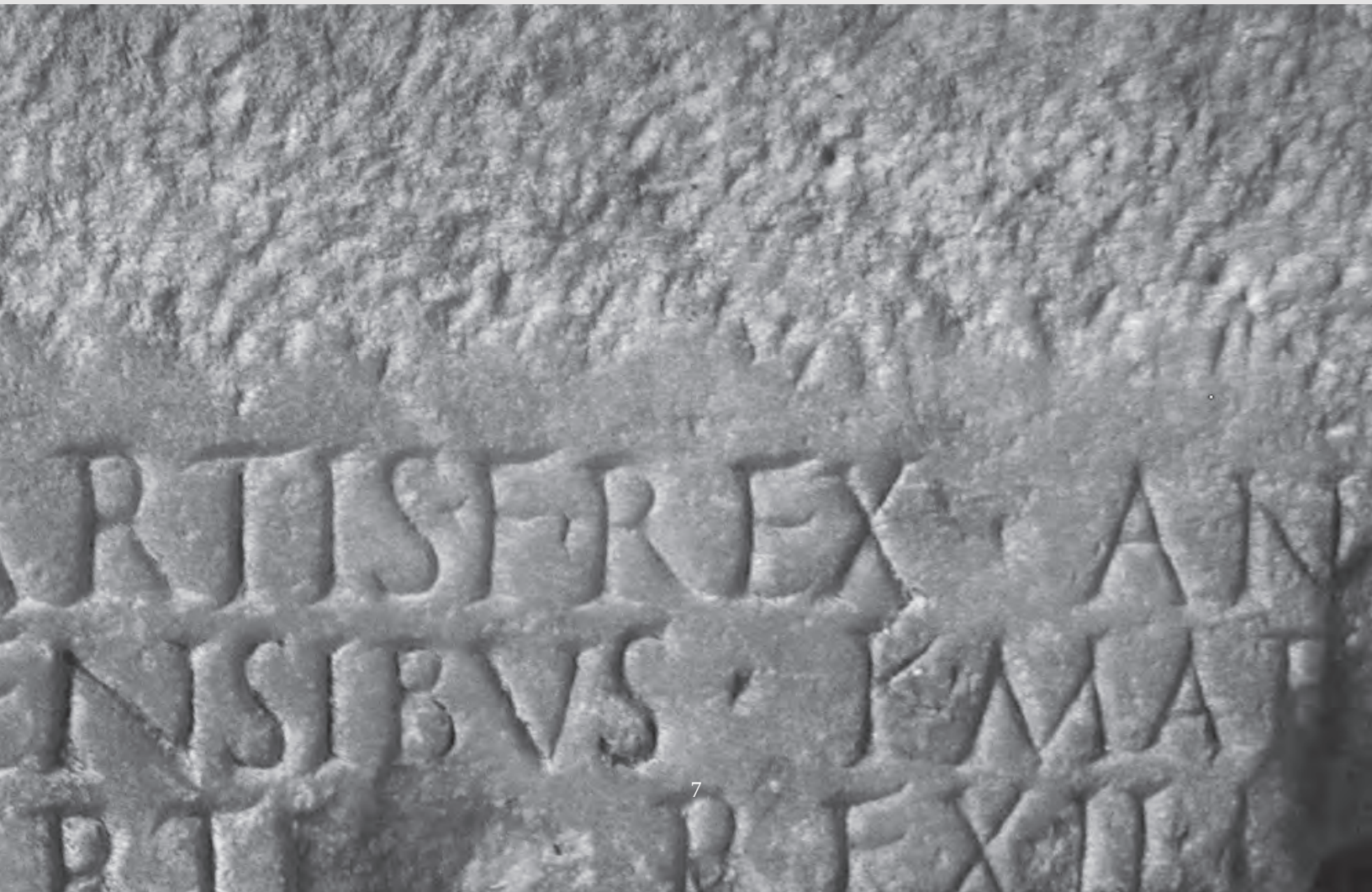
The effects of Augustus' innovation were two-fold. On the one hand, dating from the city's foundation compromised the hegemony of the consular lists. The symbolic power of Consuls as keepers of time was broken, supplanted by a system of time reckoning that reached beyond the history of their title. They became non-essential to the measure of time,[13] just as they would become increasingly non-essential to governance. More broadly, Augustus' calendar emphasized that Rome's history was more enduring than the Republic—and that it originated under an autocratic rule.[14]

Figure 3

Detail of the *fasti triumphales*:

Romulus Martis F Rex An [...] / De Caeninensibus K Mar

Romulus, son of Mars, King, in Year [One] / over the Caeninenses, the Kalends of March



Marble blocks inscribed with time; historical record interwoven with myth; text joined to architecture. Foundations appear at intersections. The Romans had been conscious of their foundation before Augustus, but with the end of the Republic and the beginning of the Principate, the issue of fixing the past, and exploring the act of foundation-building, was charged and explored at new levels.[15]

This exploration occurred in building, but also in writing. Construction was slow, but swift poets set the pace for the building tradition that was to come. The authors of Augustus' period inspired and summarized a tone and an attitude towards foundation-building that was to persist for centuries.

Text and buildings are complementary in the Roman world. Romans intuitively linked text and architecture, inscribing text on buildings and describing buildings in text, so it is perhaps consistent that one may be used to explain the other.[16] Building remains succeed each other through time, but are excavated in reverse; myths are constructed backwards, but are told forwards. The slippage between these two flows is intriguing, as authors use the actuality of the monument to support their stories, and use their stories to explain the physical presence of archaeology. Story and monument serve each other.

Under Augustus, two themes took hold in the literary and built strata of Rome. The first was that an enduring foundation is deep, extending far into historical time. A second common theme, more surprising, is that a strong foundation must be continually refounded.

The task for Augustus' poets was one of synthesis. From disparate and conflicting local

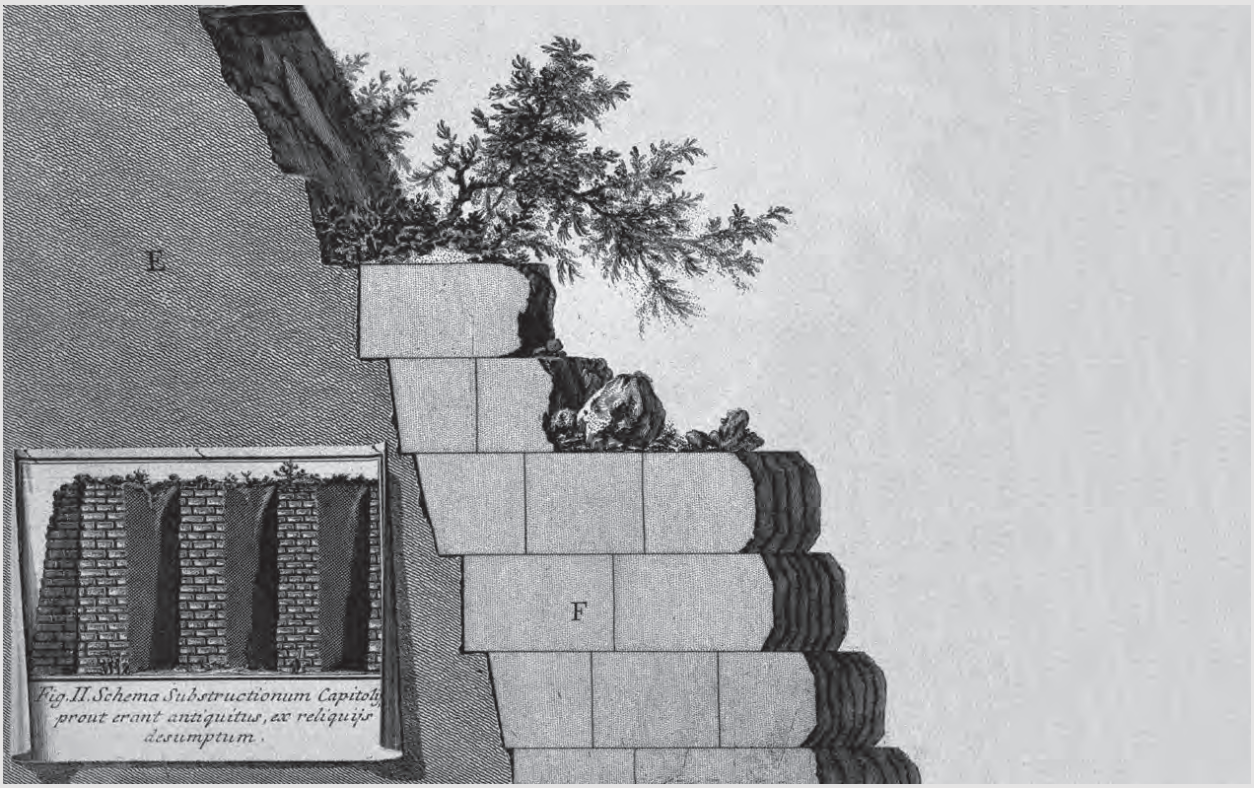


Figure 4

Le Sostruzioni del Campidoglio e la sezione della Rupe Tarpea. Giovanni Battista Piranesi.

myths with diverse timelines, they were commissioned to create a single underlying narrative whose teleological conclusion was Augustus.[17] Augustus' deft politics had inducted authority over time from the Consuls to the Founder; now poets had to link the Princeps to the original founder, Romulus, to give him that authority over time.

Less immediately obvious is that poets, in extolling the power of the founder, were compelled to use the same device to assert their own literary authority. Livy, Virgil, Vitruvius and Ovid acknowledge that through their writings, they are 'founding' history, story, and time. When Virgil explains how 'hard and huge a task it was to found the Roman people',[18] he creates an appropriate prologue for his own epic: the implication lies just below the surface that his 'song' will provide a weighty and enduring foundation. Livy is more direct: 'My task, moreover, is an immensely laborious one'—despite all pretentions of modesty, he is Aeneas, constructing 'the story of the greatest nation in the world'.[19] In *Fasti*, Ovid likewise styles himself as '*conditor*', or founder, of the Roman year.[20] The image of the founder is impressed on both patron and poet, and the writers make sure to emphasize the enormity of their tasks as they gather ancient material to assemble a coherent structure.

Virgil is particularly ambitious in crafting a sweeping narrative. His *Aeneid* hinges on the foundation of the city, as declared in the tenth line of the prologue, but the events he describes take place centuries before Romulus. Virgil's purpose is to deepen the foundation of the city in time. Three scenes, concentrated in a few stanzas at the precise centre of the *Aeneid* epic, summarize his devices and mandate.

Figure 5
Foundations of Capitoline Hill

In Book Eight, fugitive captain Aeneas, buffeted through his travels over sea and land by the goddess Juno, has finally arrived on the site where Rome will be established. Hints of Rome's future greatness lurk everywhere, and one of the most tangible comes in the form of a divine gift, a shield, received before Aeneas' first battle.

The shield is described with the words *non enarrabile textum*.[21] This phrase is sometimes translated "inexplicable [or 'indescribable'] fabric," referring to the metal masterfully layered by the god Vulcan.[22] *Textum*, however, may also simply denote 'text': the shield that Aeneas receives on the site of Rome is an inexplicable text.

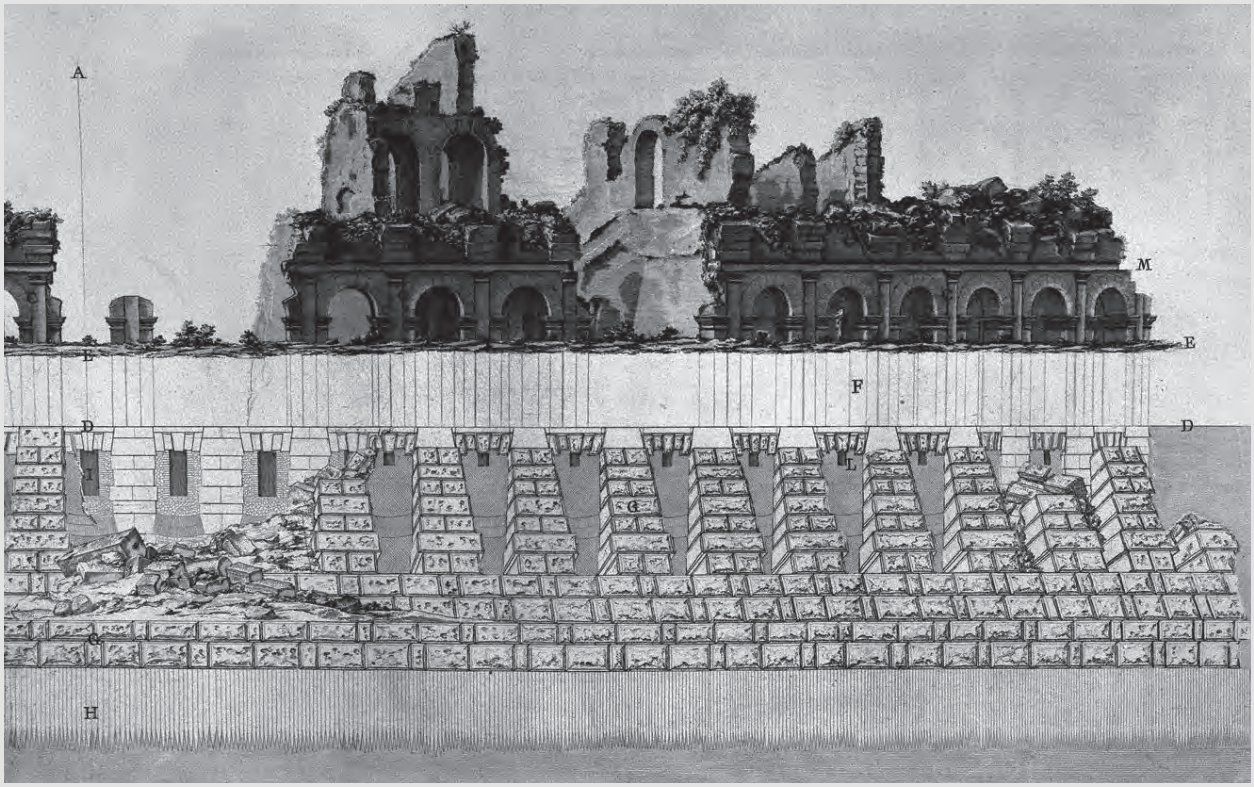
The word is a hinge from the description of the shield to a description of what is on the shield. The lines that follow explain that Vulcan has wrought the future story of Italy, including, in order (*in ordine*), all the wars fought by Aeneas' descendants. The shield is thus a list, connecting Aeneas through contiguous layers of myth, into the history of Virgil's time.

Lists are a common Roman tool for spanning generations. Livy's *Ab Urbe Condita* embellishes the lists canonized by annalists in the last generation of the Free Republic.[23] The *fasti anni*, and the *fasti triumphalis* erected by Augustus, use lists to do the same work. They make the past accessible via small and consecutive gradations.

Where they are used to span epic distances, such as those between Aeneas and Caesar, lists have the capacity to generate a continuum between myth and history. The foundation of the city occurs along this continuum, but its exact location is labile. The foundation may be

Figure 6

Le antichità Romane, t. 4, tav. XXVII. Uno dei frammenti dell`antica pianta di Roma indicante la pianta della scena del Teatro di Marcello. Giovanni Battista Piranesi.



located in either historical or mythical time, depending on an author's purposes.

Livy expresses this borderline condition when he begins his chronicles with the statement that "Traditions about what happened before the foundation of the City, or while it was being founded, are more suited for poetic fictions than for the trustworthy records of history."[24] As historian, he places the foundation on the brink of history.

This chronology is helpful to him. Livy acknowledges that the ancients, "by intermingling human actions with divine…confer a more august dignity on the origins of states." Evidently, Livy seeks to emulate them, beginning his 'history' with the same powerful myths of old, even as he maintains a respectable air of scepticism as a distinguished annalist.[25]

Romulus's foundation may be treated as a myth; on the other hand we see a strong impulse to prove the historicity of Romulus, as evidenced in the very act of attaching a precise date to the foundation of the city.[26] The uncertainty as to whether the foundation belongs to mythical or historic time serves writers and their respective agendas; simultaneously, the ambiguity serves the imperial program, which reaps the benefits of myth and history from a single pivotal event.

Virgil, as poet, uses the shield as a mythohistorical register to draw out the ambiguous gradient across the centuries. Connecting such characters as Aeneas, Manlius, Romulus, and Augustus, the poet includes each hero in the process of foundation, imparting on each a sense of historicity, and also a profound sense of myth.

Figure 7
Tufa blocks of the Teatro di Marcello.

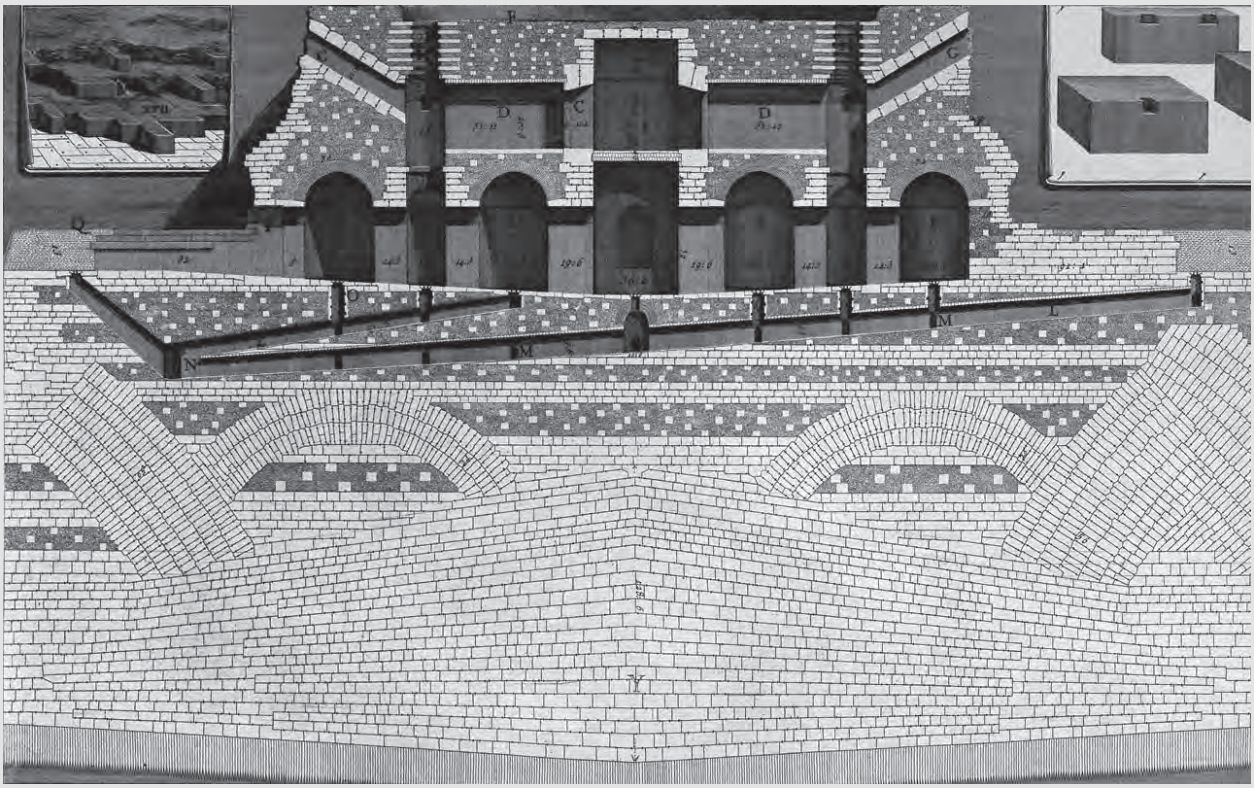
In addition to his exploitation of the list, Virgil creates depth by appropriating other, older narratives. As Vulcan crafts the shield, Aeneas and local King Evander sit down together in an Open Court. Evander's first words make explicit this fundamental theme: "Greatest of Trojan captains," Evander addresses him, "never while you live shall I consider Troy to be gone and her kingdom captured."[27] Through Evander, Virgil asserts that Rome's foundations are built upon the foundations of another great and more ancient city.

An astonishing number of ancient cities claimed a heritage from Troy, wishing to partake in the prestige of Homer's epic.[28] As the author of Rome's answer to the *Odyssey*, Virgil reopens the story of Troy's destruction and reworks it to suggest that the city was not utterly destroyed. The great city, whose walls were taken by Carthage, persists through Aeneas, founder of Rome. By extension, the history of Troy is adjoined to the history of Rome.[29] Rome's foundation in some way becomes equal in antiquity and authority to the highly-regarded history of the Greeks.[30] All authors must endeavour to reconcile local stories into a coherent history, but Virgil dextrously melds the foundations of two great cities into one narrative, deepening Rome's foundation.

The power of the prior foundation arises in other contexts as well. The Temple of Jupiter is worthy of mention. It was traditionally associated with the founding of the Republic and the expulsion of the Tarquin monarchy, with the implication that Rome began when it became a Republic.[31] Augustus, engaged in undoing Republican structures and returning to an autocracy, de-emphasizes the Temple's anti-monarchical symbolism by foregrounding a prior

Figure 8

Le antichità Romane, t. 4, tav. VIII. Spaccato del Mausoleo di Elio Adriano e del Ponte S. Angelo. Giovanni Battista Piranesi



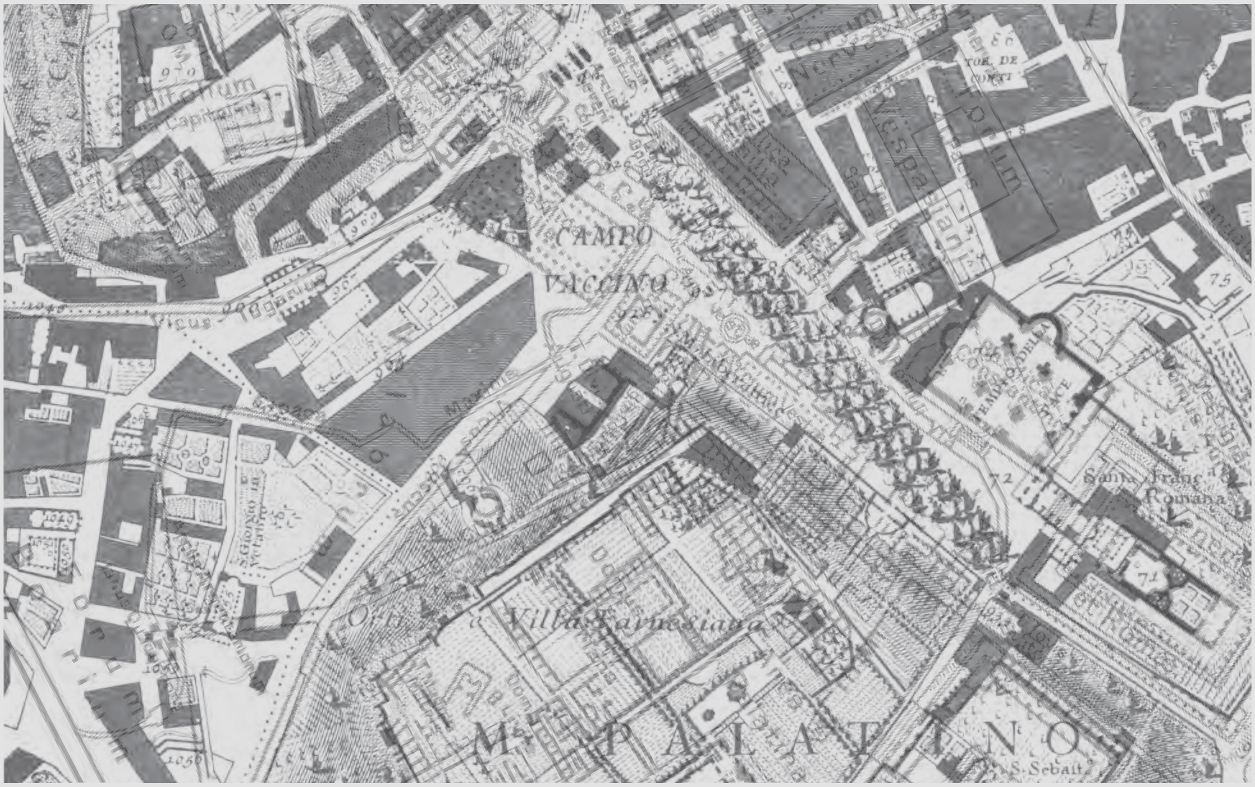
story. King Romulus, Livy explains, dedicated the precinct to Jupiter in the first year of the City's foundation.[32] The origin of the temple is re-synchronized. Like Virgil, Livy unearths a deeper foundation structure to support his propagandistic platform.

A final device by which Virgil founds the city deeply is his description of Aeneas' walk with Evander through the grounds of the Palatine. While the conversation in the Open Court acknowledges deep foundations from a distant land, the walk along the Tiber River shows the depth of existing foundations on the site of Rome itself. As the prince and king walk through the thick brush of Evander's homeland, they come to "walls long fallen down…monuments of the ancients."[33] These ruins were ancient strongholds founded by Saturn and Janus. Evander's rustic, Arcadian territory is already littered with the built remains of the past. Even before the city is built, immense foundations are already embedded in the soil.

Virgil's deep foundations acknowledge linear time, with their lists, accreted histories, and layered sites. The foundation endures, and it provides a useful datum by which to measure other events. This is the foundation that Augustus acknowledges in the *a.u.c.* dating of his annular calendar. But the foundation also belongs to the *fasti dies*, the cycle of time that recurs upon itself, as the same poetic devices indicate. Building upon ruins is not straightforward.

The walk with Evander along the cyclical yet continuous Tiber River reveals this dual condition of the foundation. As the princes navigate the landscape they also navigate

Figure 9
Mausoleum of Hadrian.


CAMPO
VACCINO
PALATINO
Santa Franc. Romana

time. Past and future kingdoms are projected onto the site. The rustic woods anticipate where Romulus will collect his fugitive settlers, and where Augustus will build in gold and marble. A grotto is the site where Romulus and Remus will suckle a she-wolf, and is the location of Augustus' palace. Cattle low in the fashionable district of the Forum known to Virgil's contemporaries. Time is collapsed to an instant, from the wilderness of Arcadia to the Golden Age of Saturn, to a "meaner tarnished age" to the promise of Aeneas' kingdom, forward to the crude beginnings of Romulus, and finally to a new Golden Age of Augustus. The landscape reveals Rome's cycles of ruin and recompilation.

Commenting on the scene, Zetzel identifies its crux in Virgil's use of the term *olim*, 'once'.[34] We read the term in lines 460-461: *aurea nunc, olim siluestribus horrida dumis*; "golden now, at one time bristling with thickets." *Olim*, 'at one time,' may refer to either a present or a future period. The play of '*olim*/*nunc*'—'once/now'—is ambiguous. At first read, the line suggests that the Capitol, now golden (in Virgil's time), was at some past time covered with thickets (in Aeneas' time); but equally it may evoke the Capitol, now golden, at some *future* time covered with thickets.

In this is the power of Virgil's image. Having initiated a cyclical rhythm from Saturn to Aeneas to Augustus, Virgil implicitly prophecies future cities and future ruins. Significantly, it comes to pass: generations since Augustus' Golden Age may be projected easily into this composite Rome. The medieval Forum was again a cow field; Papal and Fascist leaders sought to restore golden glory; modern tourists are like Aeneas among the ruins.[35] In Virgil's

Figure 10 (facing)
Composite plan of Nolli map and archeological survey in area of the Forum.

Figure 11 (below)
Roman Forum: Temple of Saturn in centrefold of page. Basilica Iulia, right.

text, time and history repeat themselves. *Olim* is ceaselessly nostalgic and ceaselessly forward-looking. Each ruin is a monument to a golden past, and the material from which the future may be constructed; each foundation anticipates its own ruin.

Livy also dwells heavily upon this cycle of disorder and reconstruction. He writes his chronicles as Augustus takes power and imposes order and forced peace on the land after a century of civil war. Livy projects his contemporary pattern of conflict and resolution across the whole historical landscape of Rome. He ostensibly seeks lessons as the might of the imperial people is "already beginning to work her own ruin,"[36] but in fact he is crafting an answer: a way out of this ruin. *Ab Urbe Condita* tells the history of Rome from its foundation, but Livy takes the apparently singular event and shows it to be cyclical. His history is a study in the recapitulation of foundations.

Livy's term *Condita*, translated 'foundation', is at its most essential a term of preservation.[37] Livy's object is to sustain Rome, keeping it forever young despite a seven hundred year history. He does this by holding it constantly in the state of beginning. Events and new construction are all measured *Ab Urbe Condita*: unlike Augustus's stone *fasti*, however, the events are not only successive but recursive. Themes perpetuate in each story of foundation. Romulus kills Remus and founds the city;[38] abruptly, Livy tells the story of Hercules slaying Cacus centuries earlier on the same site.[39] As Rhea Silvia is raped by Mars to conceive Remus and Romulus,[40] Romulus's men rape the Sabine women to perpetuate the

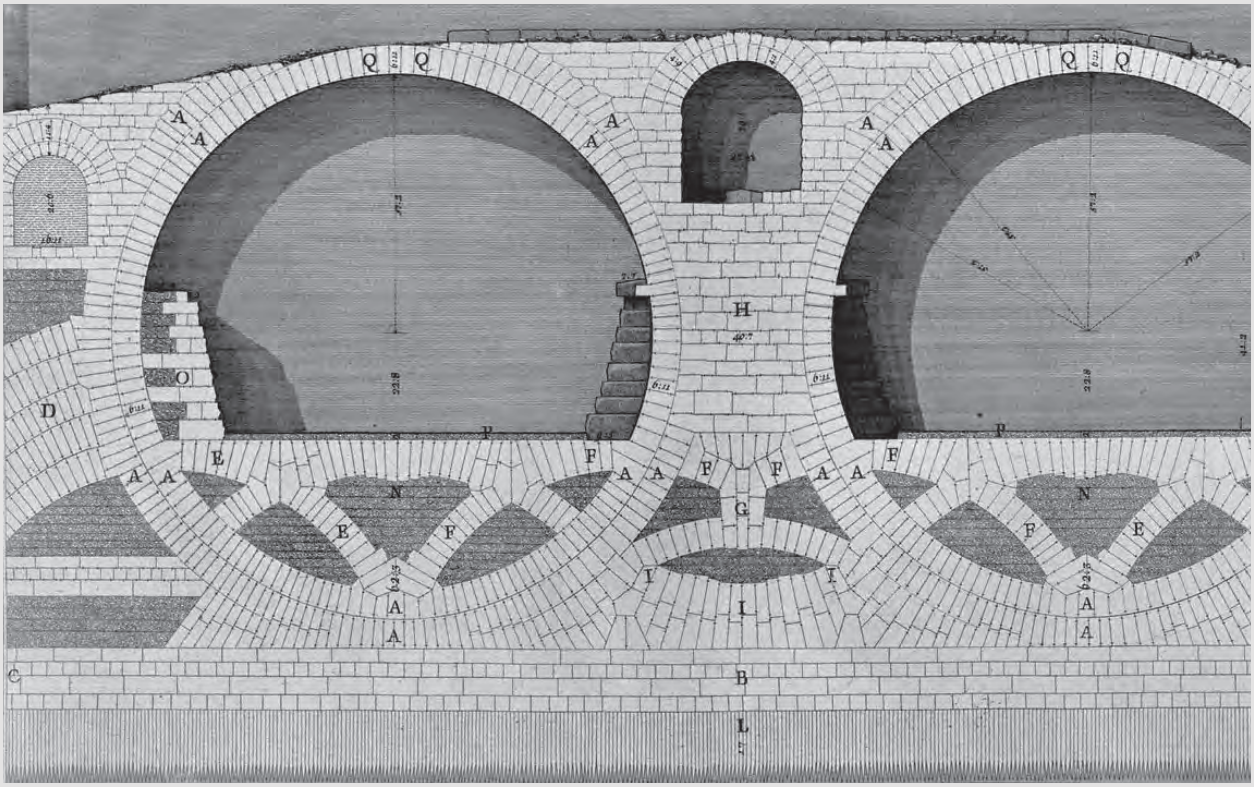


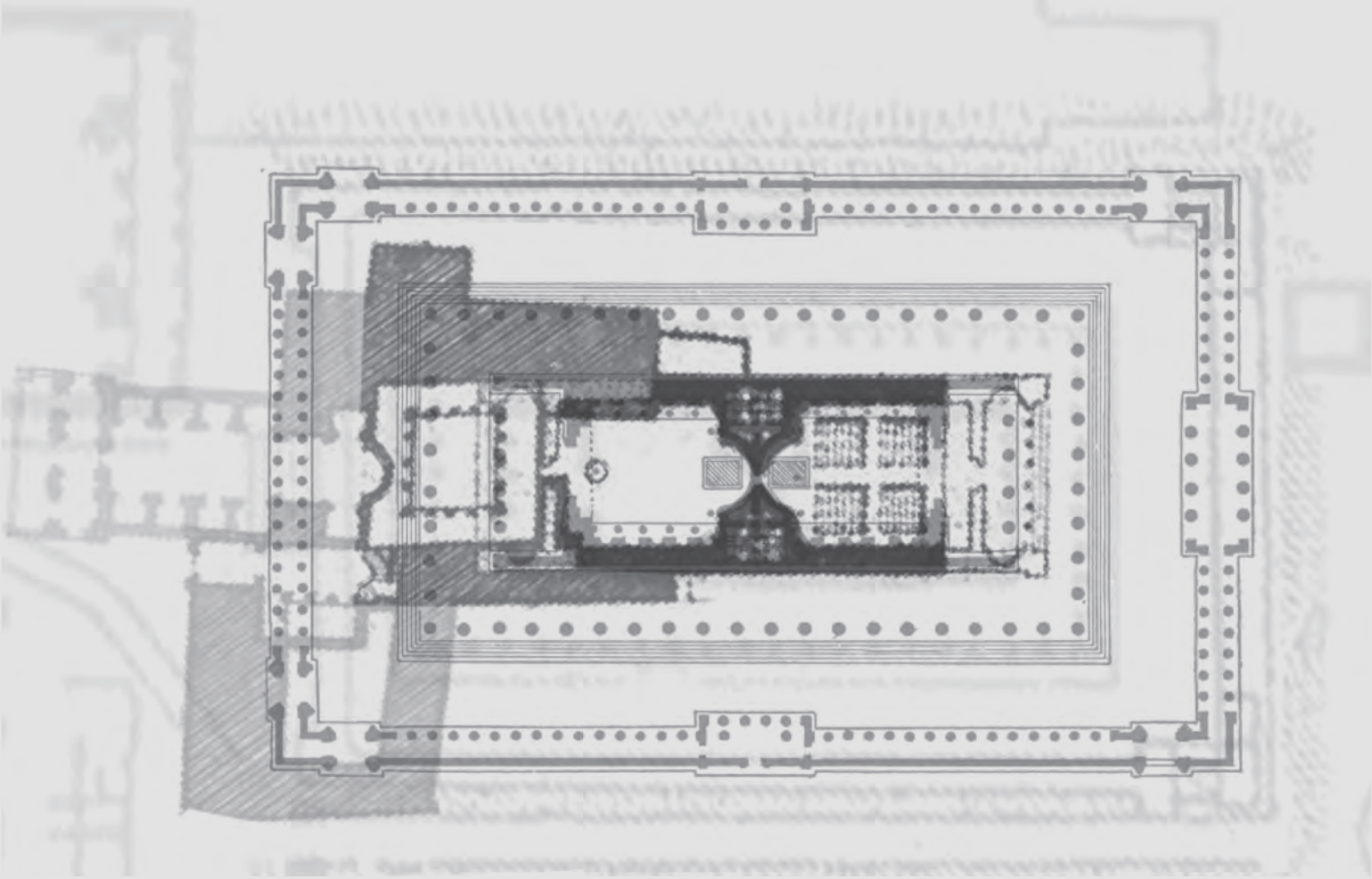
Figure 12
Cycles under the bridge. *Le antichità Romane, t. 4, tav. XIX. Pianta, elevazione e particolari costruttivi del Ponte dei Quattro Capi*. Giovanni Battista Piranesi

city.[41] Heroic Horatius is rewarded with the circle of land he can plough in a day, as befits a refounder.[42] The temple of Jupiter is 'founded' no less than five times.[43] Each foundation story begs an earlier foundation story, and each foundation is succeeded by reiteration.

Livy himself clarifies that "all the previous kings were in their own ways 'founders'."[44] His stories, however, anticipate future sovereigns as founders, as well. Romulus is deified as Julius will be deified: Romulus is murdered by the crowd as Julius will be murdered by the crowd.[45] Livy's city is never fully founded, even up until his day. Octavian is not a Greek *teleos*, perfected and conclusive: he is an augurer, Augustus, another beginning.

Serres interprets Livy's use of the conjugated verb *fundo* as a way of invoking and negotiating meanings of *fundere* and *fundare*.[46] 'Fundare' is to make firm and stable, while 'fundere' is to flow, spill or spread. The act of foundation is as much a spilling as a collecting: solution requires dissolution. At the foundation of the Roman Republic, the Tarquin King is ejected and his field consecrated to Mars. The crop of grain cannot be eaten, so it is cut and thrown into the Tiber River in the heat of midsummer. The wheat collects in the mud, forming an island; "later, no doubt, work was done to increase and strengthen it, and to make the whole area high enough and solid enough to carry buildings, even temples and porticoes."[47] Foundation follows diffusion; the confusion following an expelled monarch gives way to a new administration. The crop in the river becomes a foundation; Rome is established by scattering seed in the river of time.[48]

Figure 13
Foundations of the *Ponte dei Quattro Capi* at *Isola Tiberina*.



The crucial moment of Livy's work is not the foundation of Romulus, which is uncertain and 'better left to poets'. Livy's attention is riveted on the near-destruction of the city: the scattering of the ruins.[49] The event looms large in the Roman psyche. The Republican *fasti*, for instance, included only two strictly historical dates among the festivities: the foundation of Rome (*Roma condita*) on April 21, and its near destruction at the Allia (*Alliensis dies*) on July 18.[50]

Naturally, Livy makes the terrifying event a refoundation. As Rome lies in ruins after the Gallic sack, Camillus gathers the people of Rome. He encourages them not to abandon their city "founded with all due rites of auspice and augery,"[51] but to rebuild. As Feeney observes, Camillus mentions the 365 years since the city's foundation. The significance of this 'Great Year' would be apparent to an audience now operating under a fixed Julian calendar; further, Livy's audience would be aware that this counting implied another Great Year of 365 days between Camillus and their present day.[52]

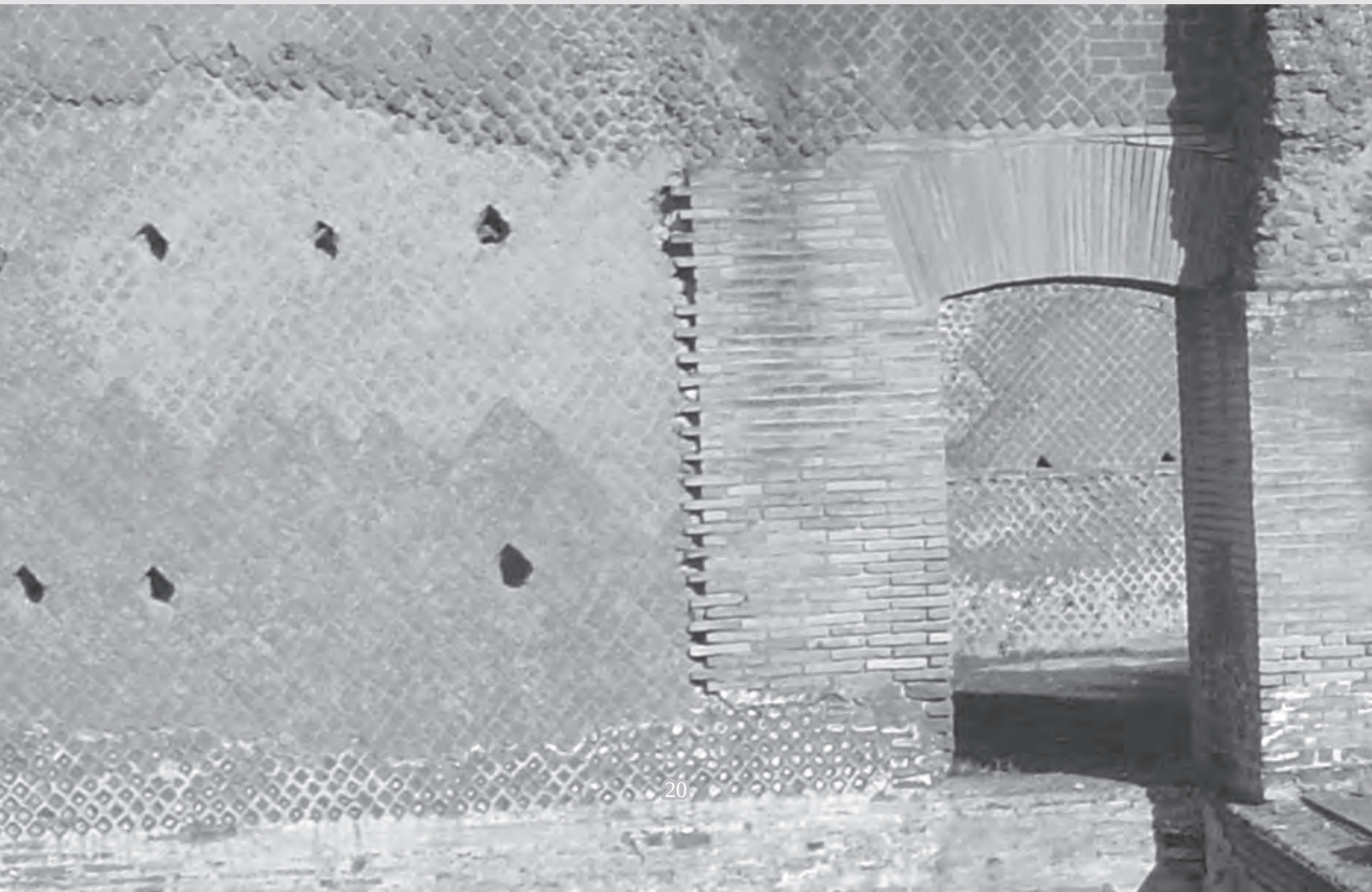
The historian's open insinuation is that just as Rome was almost destroyed by Brennus and the Gauls, but was restored by Camillus, Rome now has almost been destroyed by Anthony and Cleopatra, but has been saved and refounded by Augustus. Three foundations, under Romulus, Camillus, and Augustus, are destined and as natural as the cycle of the stars themselves.

When Livy begins the second half of history after the near-destruction of Rome, he uses

Figure 14 (facing)
Composite plan of additions and ruins of the church and temple at the site of *Templum Veneris et Romae*. 1:1000.

Figure 15 (below)
Preparing the plinth of the temple for the Pope's Good Friday address, 2012. Campanile of Santa Francesca Romana visible beyond ruins of Venus' niche.


COLLEGIO ROMANO
S. Andrea



the phrase *Ab Condita Urbe*, a modified reprise of his original title. Kraus explains that it was a Roman "historiographical convention to claim that one's work surpassed that of one's precursors."[53] Livy curiously cites his own work as an antecedent.

One the one hand, Livy's self-reference in Book Six reciprocally reinforces the authority of both earlier and later books. On the other hand, for the historian, the Gallic sack suddenly becomes the beginning of proper history. Records before the sack were destroyed, but now the annalist has access to writings, "the sole trustworthy guardian of the memory of past events."[54] From this point onward, Livy promises a clearer and more definite account, as Rome "springs up, as it were from the old roots, with a more luxuriant and fruitful growth."[55]

In a stroke, everything Livy has previously written is rendered prefoundational. Just as the tales of Hercules and Remus provided fabulous support, so too Horatius, Gaius Canuleius, and Cossus are added to the aggregate substructure of Rome. All historical material is prefatory for Livy, and at each opportunity he adds events to the pile of archival backfill. *Ab Urbe Condita-Ab Condita Urbe* is about the city foundation, but it is also about the Foundation City, growing massive in its unending cycle of beginning.

Ovid is a third author-founder of the Roman world.

At the end of his life, the former court poet understands well the official position and ideology towards foundation-building promoted by his colleagues. He has reason, however, to undermine it. Ovid has been exiled from Rome by Augustus on account of 'a poem' and

Figure 16 (facing)
Composite plan of Nolli map and Piranesi engraving of Hadrian's Villa. Diameters of the Pantheon and the Maratime Theatre are aligned.

Figure 17 (below)
Hadrian's Villa: monumental wall of the Great Baths, and bracing

an unidentified ‘error’. Relegated to the half-Greek city of Tomis on the fringe of the Roman Empire, Livy’s new world is barbarous,[56] intemperate, and non-Latin-speaking.[57] Having unsuccessfully pled his case to Augustus and Tiberias, Ovid returns to his poetry to address the latest Caesar, Germanicus, who is also a writer.[58] He reworks his oldest Fasti, and the result is a polemic.

“Let others sing of Caesar’s arms, me of Caesar’s alters!” Ovid declares in the preface to his poem.[59] This is a logical statement within the context of a calendar theme. Rüpke has argued that each day of the Roman calendar was linked to the historical event of the foundation of a temple. Temple foundations ‘ranked highly in the historical events retained in Rome’s collective memory’; as artefacts on the physical landscape they were powerful mnemonics for time as well as place. Their presence in the city gave identity, focus and substance to the calendar’s abstract dedication days.[60] It would be reasonable to expect Augustus’ built works and patronage of the city’s architecture to feature in a calendrical poem.[61]

The poem that Ovid writes, however, is suspiciously reticent in mentioning Augustus’ projects. In the entire work there are only two descriptions of the emperor’s building campaigns, and both of them are constructed precariously.

On the Kalends of February, Ovid makes the most direct statement to Augustus as founder, declaring him ‘Builder of temples, holy rebuilder of temples’.[62] The fumbling voice of Ovid’s narrator ‘unwittingly’ undermines the gesture, however, by using the occasion to

draw attention to the ruined temple of Juno Sospita, close by Augustus' own house. The celebration of Augustus, "under whom no shrine experiences age,"[63] is pointedly incongruous with the context. Boyle and Woodard note Ovid's use of wordplay to stress the point: ironically, Juno *Sospita* sounds similar to *positor* ('builder') and *repostor* ('rebuilder').[64] Ostensibly honouring Germanicus' predecessor, Ovid in fact wryly questions Augustus' claim to the titles.

The second reference to Augustus' altars occurs on the Kalends of May. Ovid's narrator describes the altar of the *Praesites Lares*, gods from antiquity who guard and protect the city. The poet tries to find their ancient shrine, but cannot locate the gods. They have been worn and toppled by 'the force of passing years'. Now all the poet sees are the new Lares Augusti: "Rome has a thousand Lares and our leader's Genius. They are his gift."[65] Augustus seeks to construe the refounded cult of the Lares Augusti as a link to the past, but the poet's inability to find the Lares amidst a thousand of Augustus' shrines implies the discontinuity of tradition rather than its endurance. For Ovid, refoundation is an obstruction to the past.[66]

Ovid promises to tell us more about Augustus' gifts in August,[67] but in his poem, August never comes. On the last day of June, the poet tells "Tomorrow's time marks the birth of Julius' Kalends: Piërdes, add the last touch to my task." With a concluding flourish, Ovid ends the cycle of the year. He stops short of July and August, Iulius and Augustus. The poet will not participate in the Caesars' restructuring of time, just as he undermines the refounders' attempts to restructure the city.

Figure 18
Hadrian's Villa: decaying Republican foundations near the north entrance to the cryptoportico

Where propagandists seek a continuous narrative, Ovid witnesses only discontinuity; where Emperor's poets anticipate phoenix-like recapitulations of the foundation from ruins through time, the exiled poet ends the cycle of time mid-stroke. Having stated his wish to avoid "cutting the cord of events" in the last line of his preface, and having sustained his voice through six books of elegiac verse, Ovid now allows his own authority as *conditor*-founder of the calendar to collapse along with Caesar's.

In choosing the calendar as his subject, Ovid exploits a device which is inherently resistant to continuous narrative. The order of anniversary days is random, with multiple events occurring on the same day in different years, allowing the chronicler to choose which to highlight. The calendar is open to change: Emperors after Ovid's time would make a point to clear superfluous observances from the start of their reigns, so that they could later add their own honours and festivities.[68] Events are shuffled readily in or out of the loose collection of dates.

Wallace-Hadrill has noted that the annular calendar has a sense of Romanness to it in its "non-chronological re-enactment of Roman history through the course of the year."[69] In its juxtaposition of times and narratives, the calendar is like a triumphal procession past the monuments of all ages of Rome: or like the urban fabric itself, discontinuous yet delightful. The calendar reveals the disorder of Rome, and Ovid revels in it. We see the same disorder in the foundation stories he tells: broken, labile, and precarious.

Figure 19 (facing)
Hadrian's Villa: unidentified fragments

Figure 20 (below)
Hadrian's Villa: improvised support for *opus reticulatum* east of the Great Baths

Figure 21 (following)
Hadrian's Villa: support for the ruins of the Caserma dei Vigili

Ovid eschewed the official narrative of epic cycles and teleology. By the time he sent his work to Rome, however, the authorized version was already being written into Rome's architecture. The patterns of Augustus' loyal poets existed in the city's fabric as well as its texts.

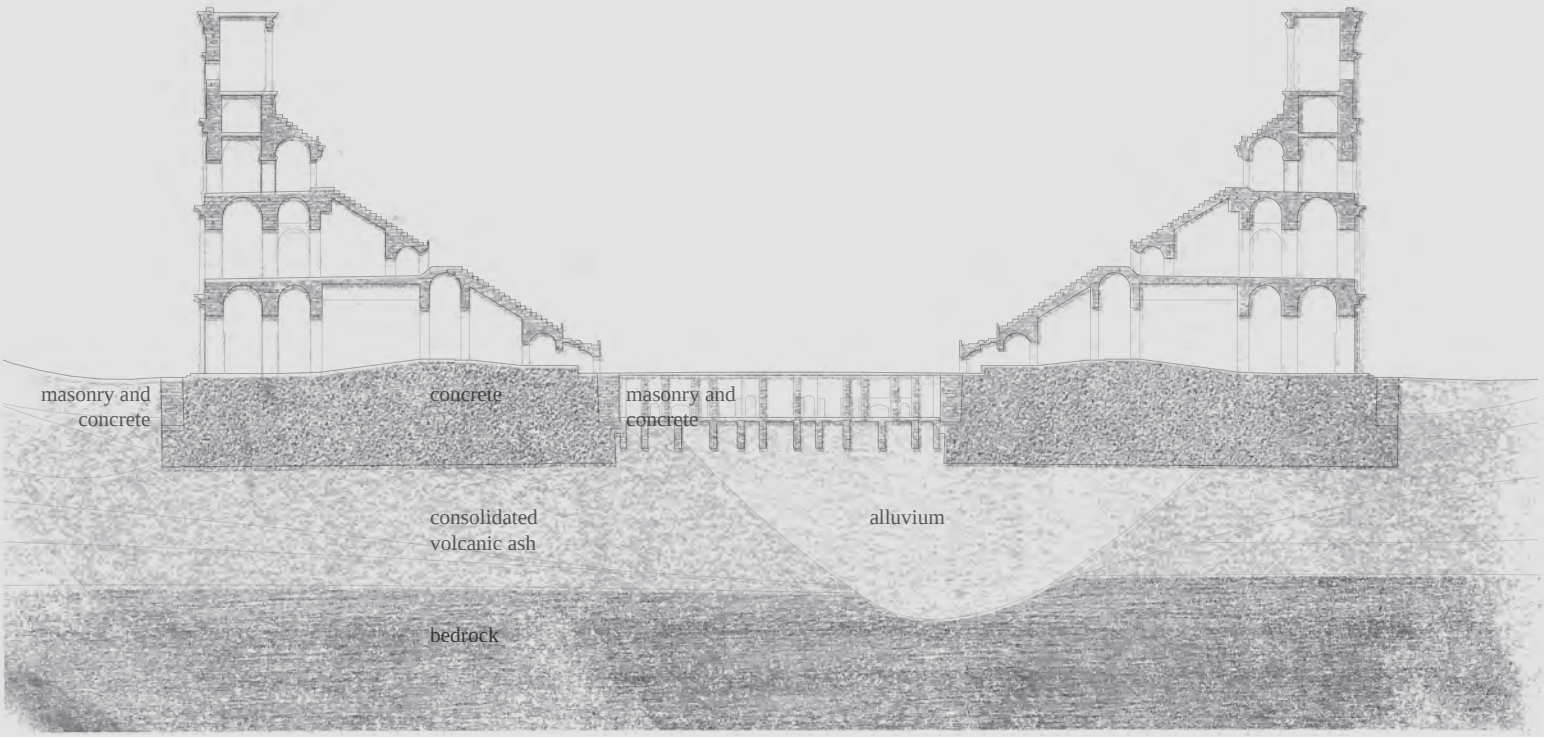
Adopting the promise of an Eternal City, Romans built unprecedented and deep foundations.[70] Poets had rendered the city in epic terms through their poetry, and now builders rendered the city as extravagantly in substance. In coming centuries, Romans would famously build at the scale of nature, their architecture as bold in meeting nature as their time charts.

The cycles Virgil imagined indeed took place. Imbued with meaning and myth, the site of Rome was a locus for reconstruction after each devastation. The influence of rhetoric on the profile of the city is persistent: in the fifth century CE, for example, six years after the sack of the Visgoths, Rutilius Namatianus again addresses a crowd. "You, Rome, are built up by the very thing that undoes other powers: the power of your rebirth is the ability to grow from your calamities," he declares, echoing Virgil's fiction.[71] With poetry, Augustus' writers successfully preserved and shaped the city by inspiring a mentality toward refoundation.

Figure 23 (facing)
Flavian Amphitheatre: section. 1:1000

Figure 22 (below)
Flavian Amphitheatre: foundations viewed from east.

Livy's *Foundation City* has come true. The architecture of Rome is foundation: the entire physical space of the city in all its layers is ceaseless preparation and ruin. Much of it lies buried beneath silt and ash, accessible only to the imagination. Conversely, elsewhere the foundation is the eventual surface: the lavish effort that the workmen buried now structures


masonry and concrete
concrete
masonry and concrete
consolidated volcanic ash
alluvium
bedrock

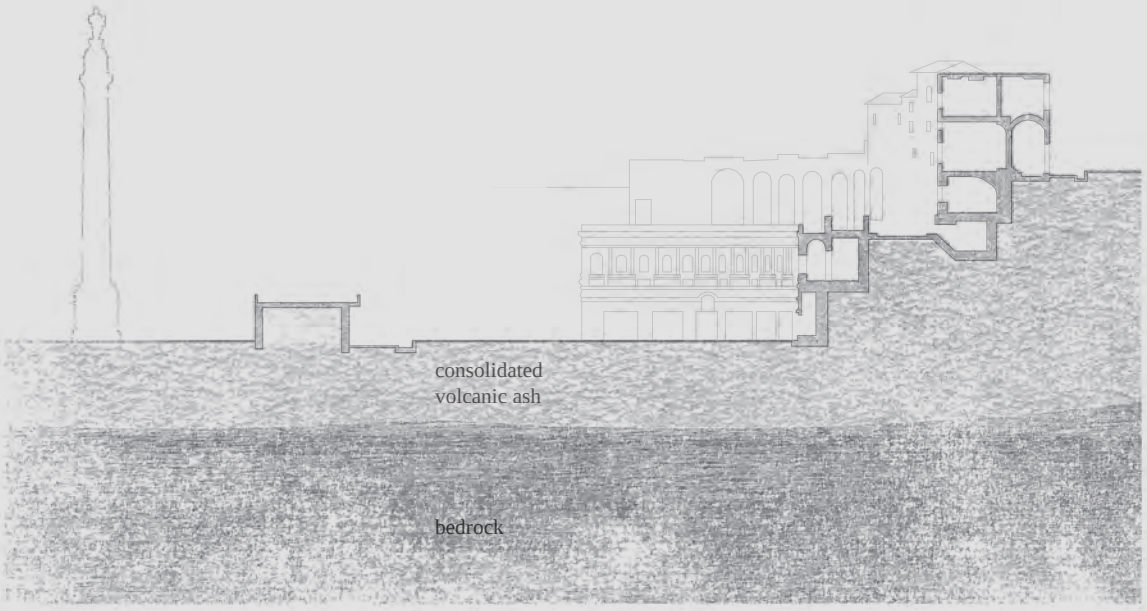


Figure 24 (facing)
Mercatus Traiani: view from southeast, showing accretions above the giant exedra.

Figure 25 (left)
Mercatus Traiani: section. 1:1000. Trajan's excavation of the Quirinal Hill integrates ingenious details for site drainage into the massive foundations.

Figure 26 (top left)

Basilica di Massenzio: section. 1:1000. The half of the building founded on man-made landfill has collapsed.

Figure 27 (low left)

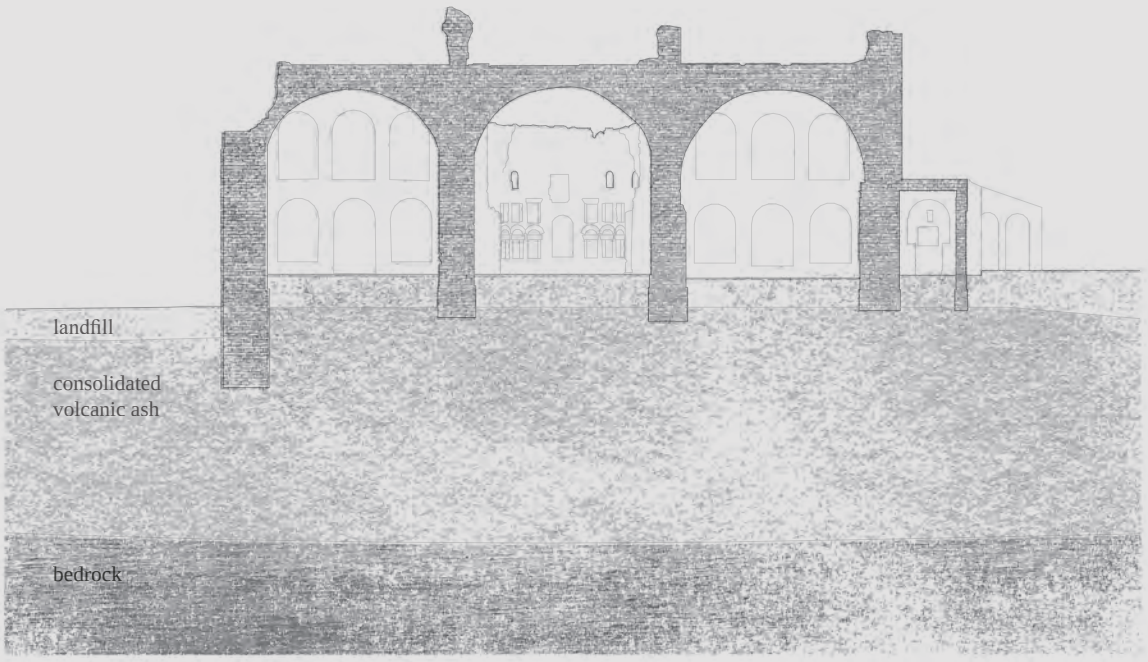
Basilica di Massenzio: view from northeast.

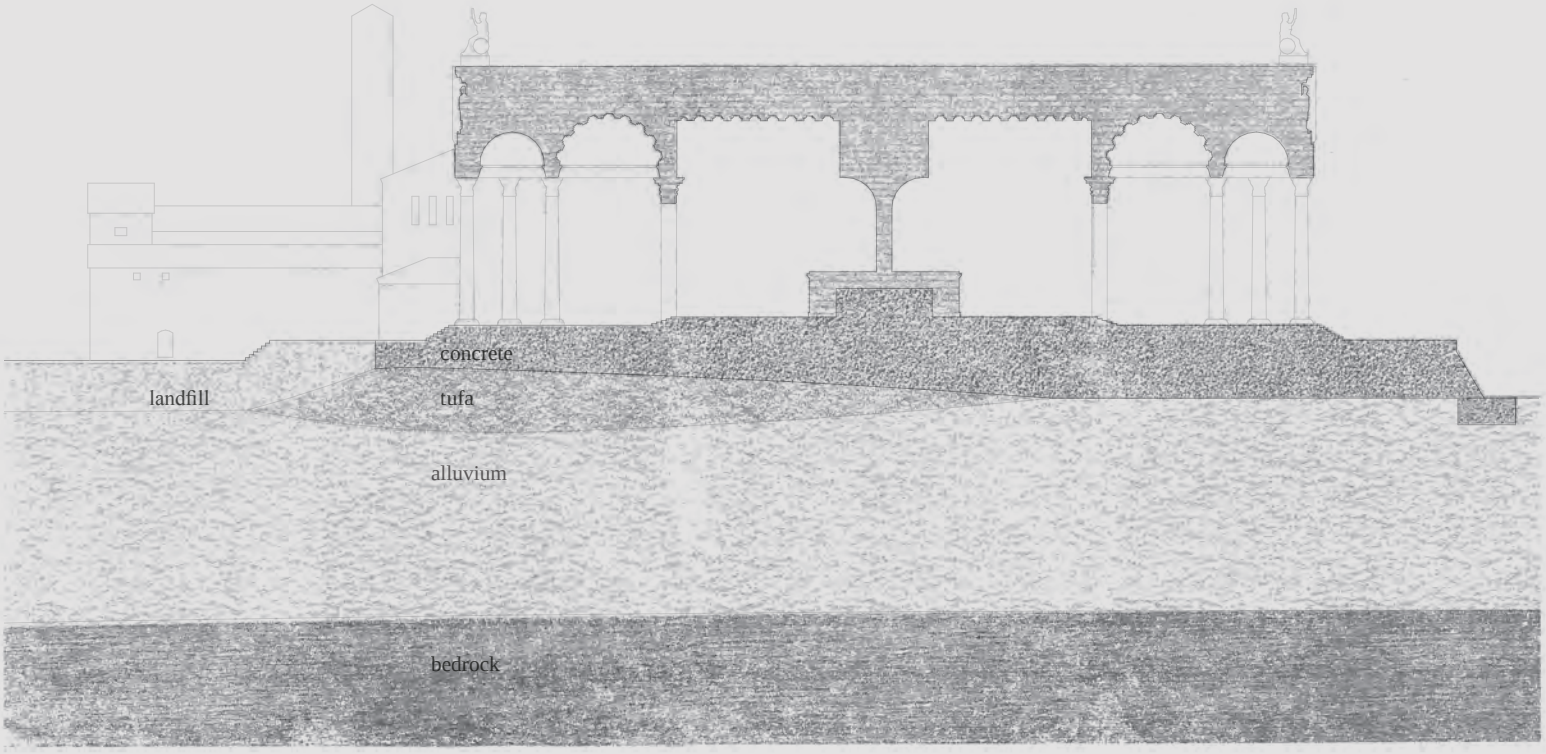
Figure 28 (top right)

Templum Veneris et Romae: section. 1:1000. Hadrian's giant temple is founded upon part of Nero's Domus Aurea, a large piece of tufa, and a new brick and concrete extension, with weaker soils beneath.

Figure 29 (low right)

Templum Veneris et Romae: view from southeast corner.




concrete
landfill
tufa
alluvium
bedrock

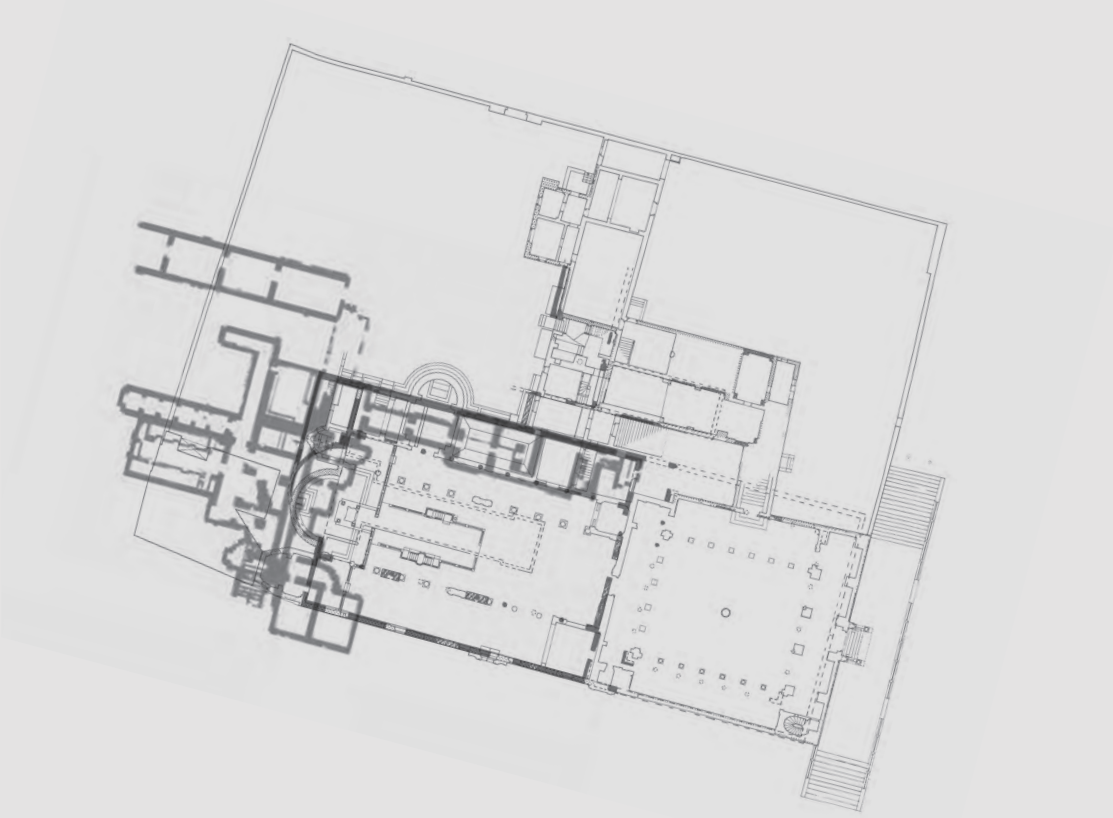
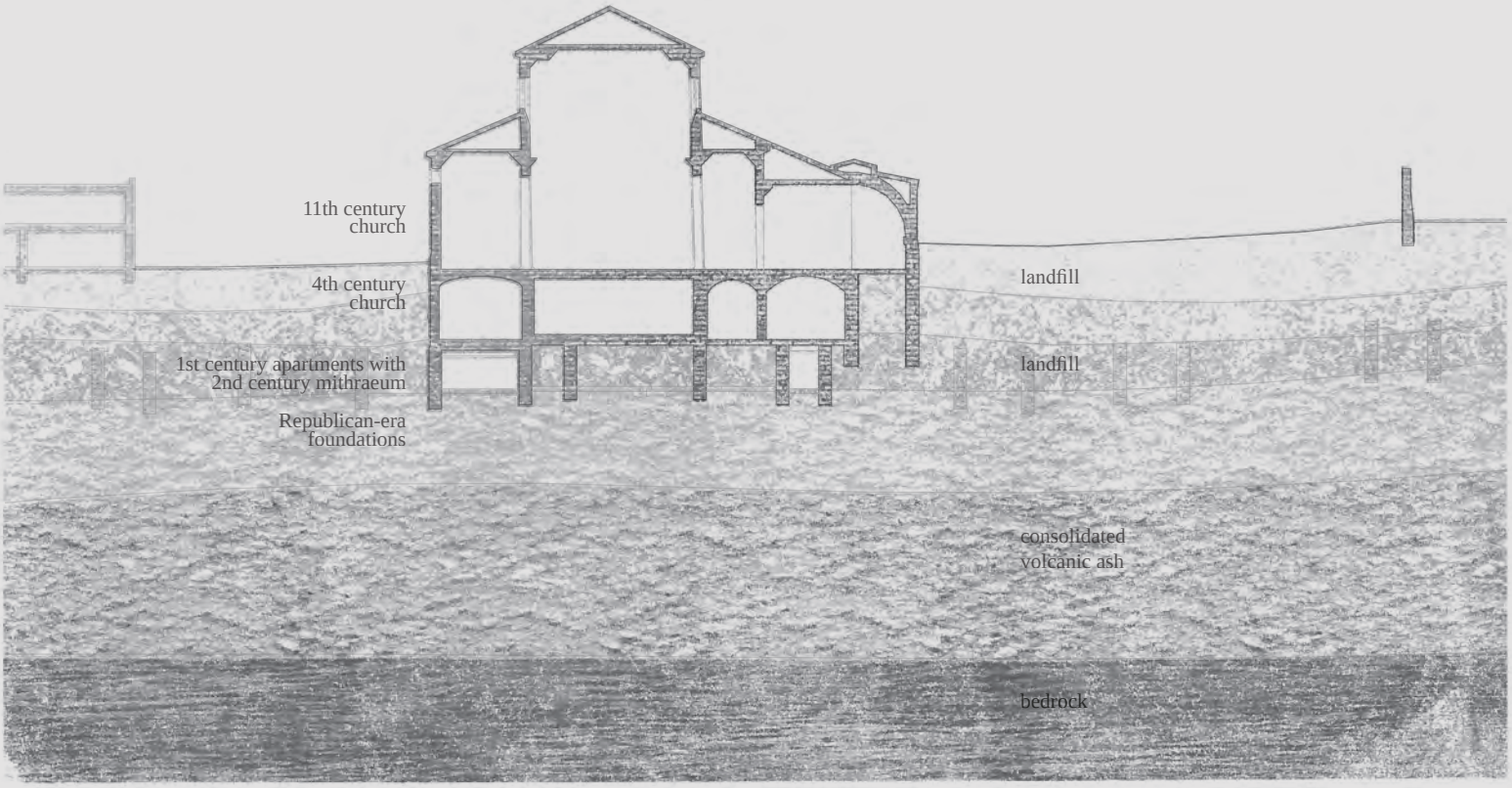


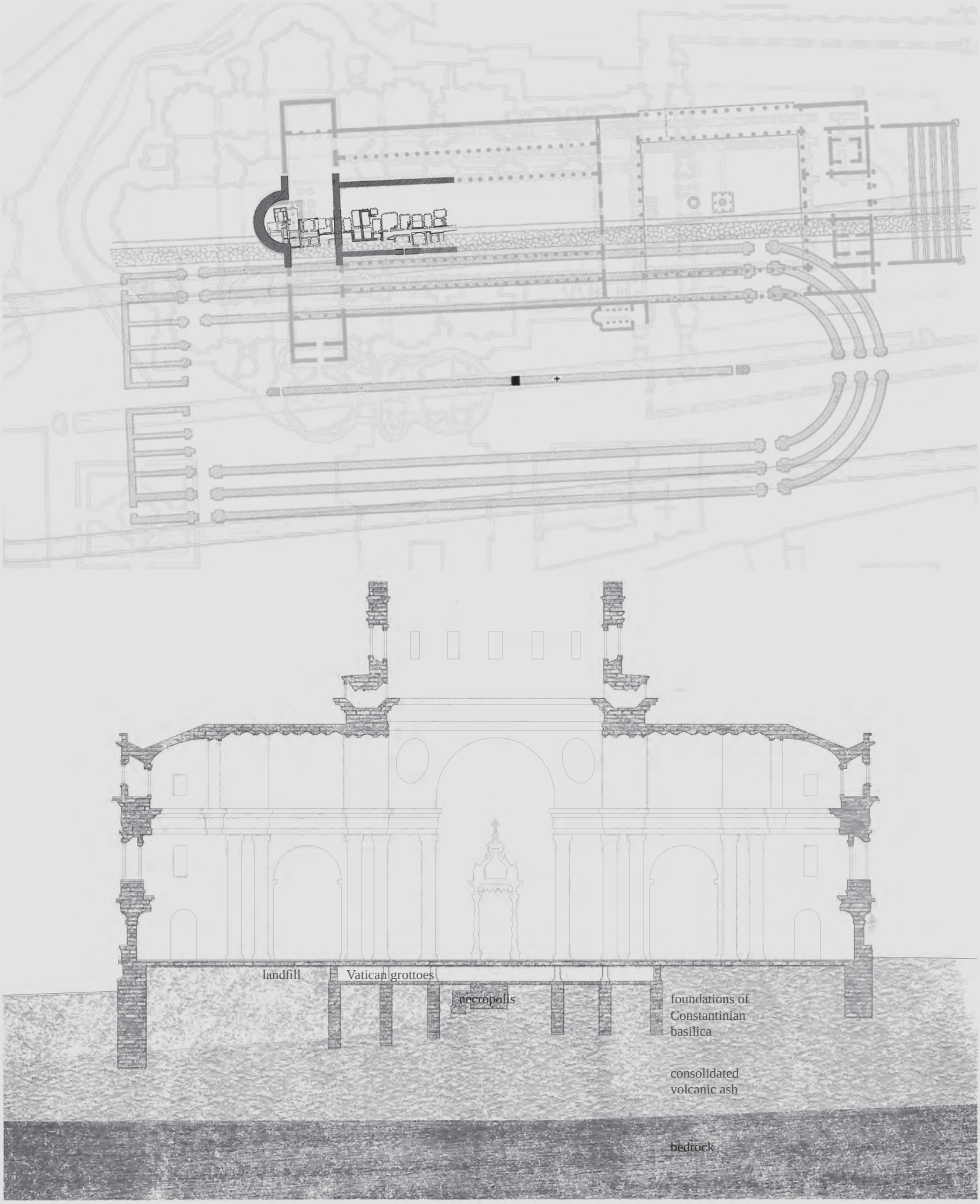
Figure 30 (top)
San Clemente: composite plan. 1:1000

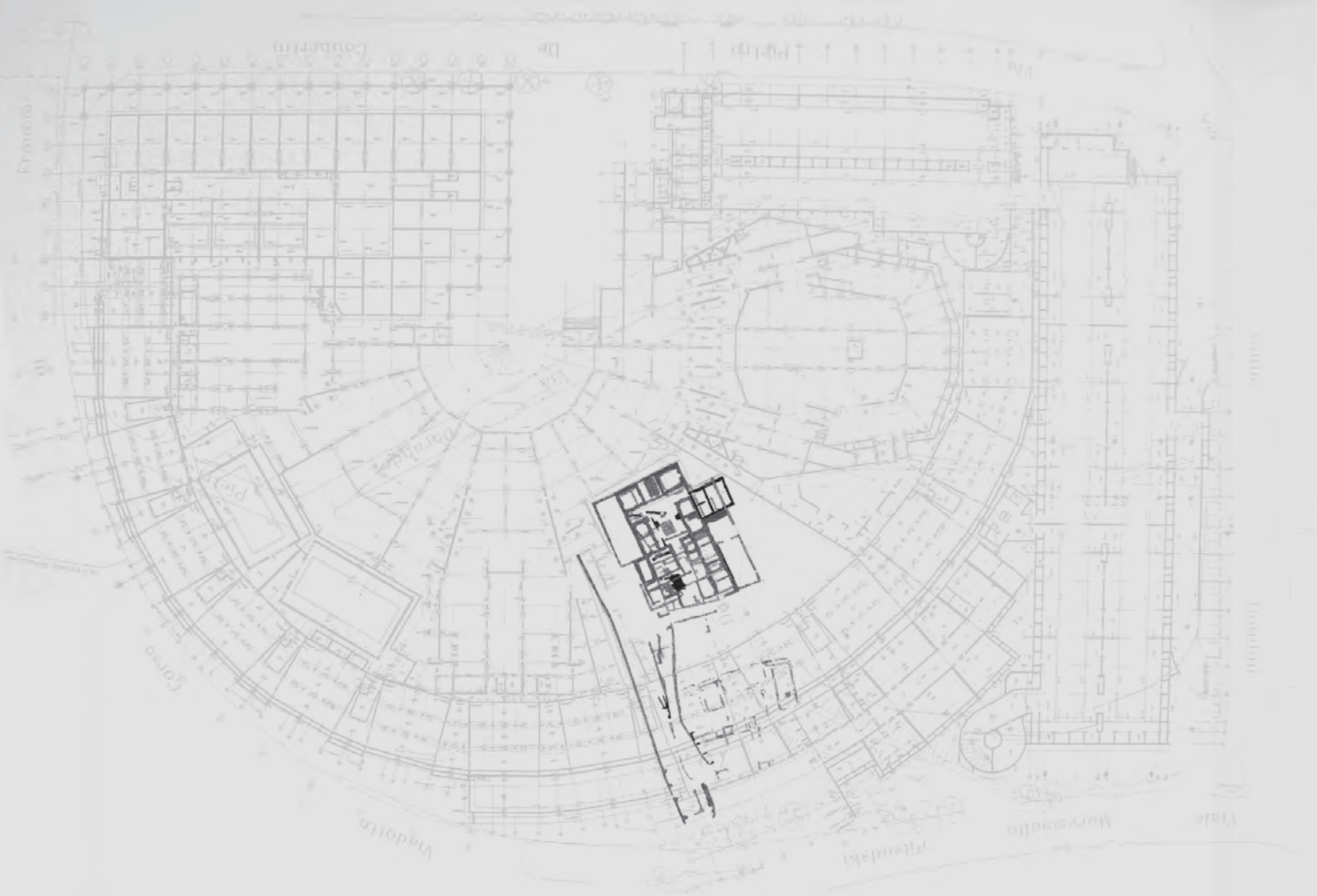
Figure 31 (below)
Basilica di San Clemente: section. 1:500

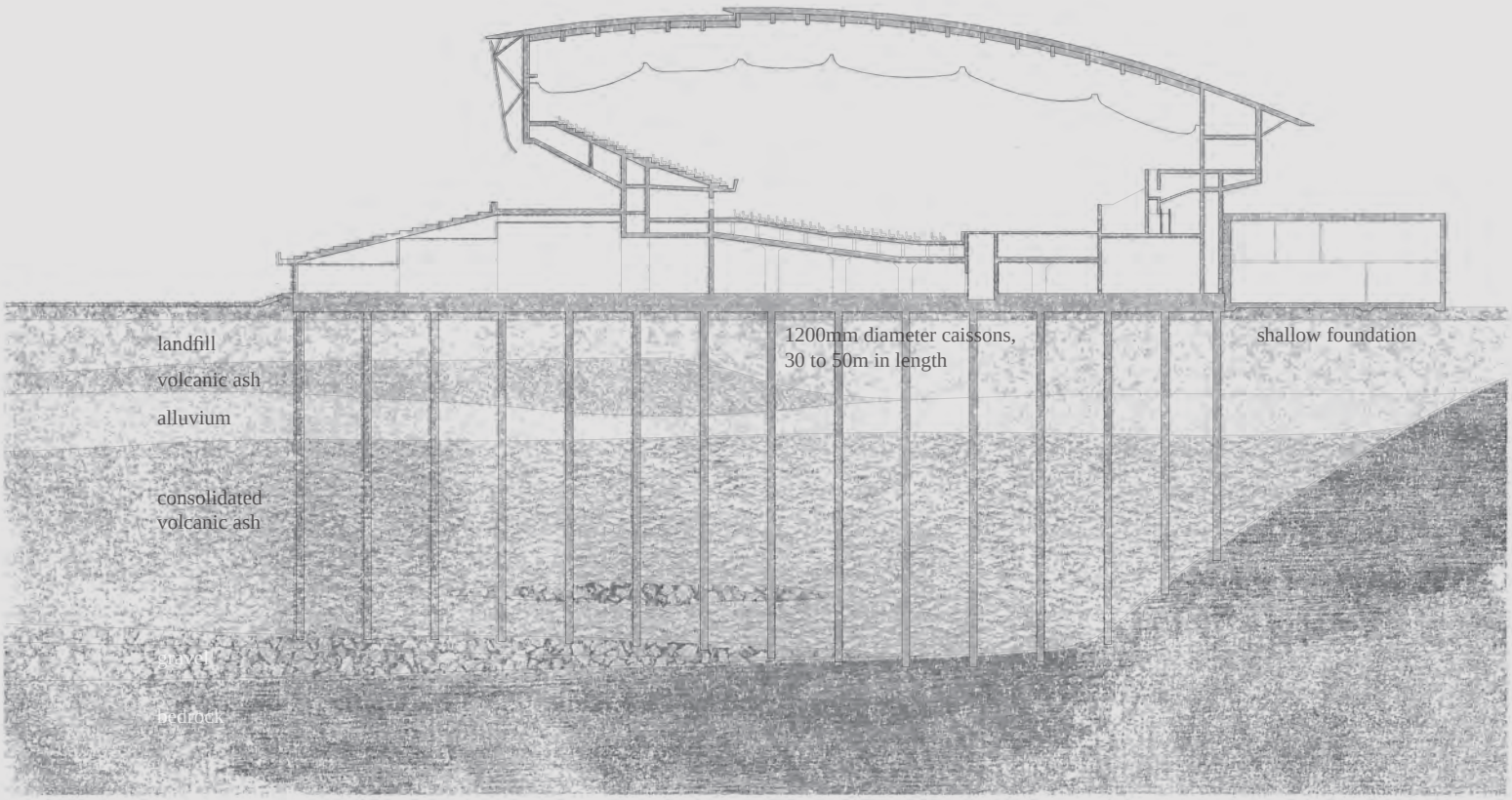
Figure 32 (top, facing)
Basilica Sancti Petri on the foundations of Nero's Circus, including (inaccurate) medieval drawings. 1:2000

Figure 33 (low, facing)
Basilica Sancti Petri: section. 1:1000




landfill
Vatican grottoes
necropolis
foundations of
Constantinian
basilica
consolidated
volcanic ash
bedrock




landfill
volcanic ash
alluvium
consolidated
volcanic ash
gravel
bedrock
1200mm diameter caissons,
30 to 50m in length
shallow foundation

the experience of the city. Set among the relics, contemporary monuments await their own deterioration and exposure as foundation-material once again. The Roman calendar has been described as a time-machine that we still inhabit;[72] equally, the Roman use of the foundation as time-machine is an idea that we perpetuate, preserving material through the dimension of time.

The *fas* is that which is permitted in the eyes of the gods. The historian[73] and the poet[74] approach their task with trembling. As they write their consular and annular accounts, they are aware of tremendous power at hand: each time that they approach the foundation, they transgress the natural division between us and the past.

Figure 34 (top left)
Auditorium Parco della Musica: composite plan. 1:2000.

Figure 35 (low left)
Auditorium Parco della Musica: section. 1:1000.

Figure 36 (below)
Auditorium Parco della Musica: view from brick plinth into courtyard. Accumulated foundation remains span the 6th century BCE to the 2nd century CE. The project monograph explains that architects spent an additional year reworking the design after these remains were unearthed.

1 Rüpke (2011) 45. "*Dies fasti*" were 'lawful days' on which to conduct business.
2 Livy *Ab urbe condita* 1.19.6-7.
3 Rüpke (2011) 100.
4 *Ibid.* 49.
5 *Ibid.*101.
6 In modern scholarship, the records are referred to separately *fasti anni* ("calendrical *fasti*") and *fasti consulares* ("consular *fasti*"), although to the Roman mind they were an interdependent unity. Feeney 168.
7 Plutarch *Life of Caesar* 59.3. Quoted in Feeney 196. Cf. Rüpke 112.
8 Simpson 61.
9 Rüpke (2011) 16.
10 Rüpke (1995) 193.
11 Technically, the *fasti triumphalis* are more appropriately termed *acta triumphalis*, as they do not belong to a continuous calendar.
12 Rüpke (1995) 193.
13 Note that *a.u.c.* era-dating was never widely adopted by the Romans. Feeney notes that there is only extant coin from Hadrian that records the date *a.u.c.*: regnal years provided a more typical and practical reference. Where Roman historians noted the years since the city foundation, it was to make a point rather than as a scientific application of an era-dating system. However, as Rüpke suggests, Augustus does appear to invent a new *Zeitrechnungsinstrument*, "time-reckoning instrument." Feeney 140; Rüpke (1995) 193.
14 Rüpke (1995) 193.

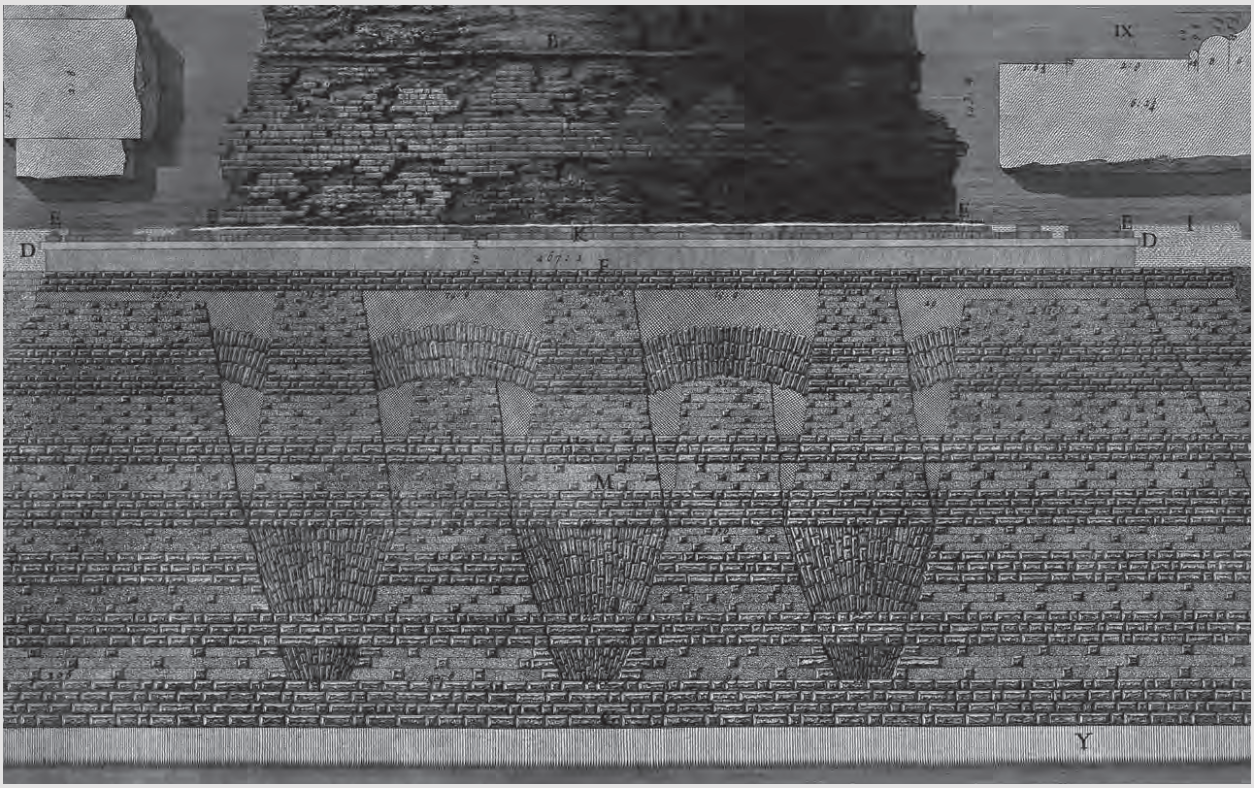


Figure 37
Exploring the depth of Rome.
Le antichità Romane, t. 4, tav. VI. Particolari costruttivi del Mausoleo d`Elio Adriano e del Ponte S. Angelo e loro fondamenti. Giovanni Battista Piranesi, 1756.

15 Woolf 16.
16 *Ibid.* 296.
17 *Ibid.* 17.
18 Virgil *Aeneid* 1.48-49.
19 Livy *Ab urbe condita* 1.pr.4.
20 Ovid *Fasti* 6.21.
21 Virgil *Aeneid* 8.846-847.
22 *Ibid.*8.603.
23 Woolf 16.
24 Livy *Ab urbe condita* 1.pr.6.
25 Feeney 87.
26 Note how King Numa and his invention of writing occur after Romulus, helping to preserve this ambiguity by keeping the written (authoritative) record outside of Romulus' historio-mythic time.
27 Virgil *Aeneid* 8.630-632.
28 Erskine 93, 254.
29 *Ibid.* 1, 27.
30 Feeney 26.
31 Woolf 38
32 Livy *Ab urbe condita* 1.12.6.
33 Virgil *Aeneid* 8.469-471
34 Zetzel 21.
35 Feeney 164.

36 Livy *Ab urbe condita* 1.pr.4.
37 "Condio"; "Condo." Many thanks to Eric Haldenby for his illumination of the phrase.
38 Livy. *Ab urbe condita* 1.7.2-3.
39 *Ibid.* 1.7.7.
40 *Ibid.* 1.4.2.
41 *Ibid.* 1.9.
42 *Ibid.* 2.10.12.
43 *Ibid.* 1.12.6, 1.38.7, 1.55.1, 2.8.5-6, 4.20.7.
44 Livy 89.
45 Serres 90.
46 *Ibid.* 263
47 Livy *Ab urbe condita* 2.5.4.
48 Serres 269.
49 Livy *Ab urbe condita* 5.54.5.
50 Feeney 184.
51 Livy *Ab urbe condita.* 382.
52 Feeney 101.
53 Krauss 83. Cf. Livy *Ab urbe condita* 1.pr.2.
54 Livy *Ab urbe condita* 6.1.2.
55 *Ibid.* 6.1.3.
56 Ovid *Trista* 1.2.30-32.
57 Boyle 1.

58 Ovid *Fasti* 1.23-25.
59 *Ibid.* 1.13.
60 Rüpke 99.
61 Cf. Vitruvius *De architectura* 1.pr.2.
62 Ovid *Fasti* 1.63.
63 *Ibid.* 1.61.
64 Cf. Boyle xxxix.
65 Ovid *Fasti* 5.145.
66 Feeney 160.
67 Ovid *Fasti* 5.147-148
68 Rüpke (2011) 21.
69 Wallace-Hadrill 226.
70 Ward-Perkins 68.
71 *De reditu suo* 121-128. Quoted in Feeney 104.
72 Feeney 213.
73 Livy *Ab Urbe Condita* 1.1.1. "The task of writing a history of our nation from Rome's earliest days fills me…with misgiving."
74 Ovid *Fasti* 1.16. "Drive from my heart this dreadful terror."

Figure 38
Exploring the ruin and reconstruction of Rome.
Capriccio decorativo; un gruppo di rovine popolate di serpenti, sormontato da una antica tomba; un pino di delicata morsura nel fondo; in basso a destra una tavolozza.
Giovanni Battista Piranesi.

Figure 39

Depth, ruin, reconstruction—and precariousness—in a single image. Palatine: view from southwest.

Netherlands

Waterline and Ornament

Johannes Hudde understood his culture deeply.

The son of a merchant, his life coincided with the Netherlands' 17th century Golden Age. He studied mathematics at Leiden, and was considered by his contemporaries to be among the most brilliant living mathematicians of his day.[1] He collaborated on a translation of *La Geometrie* into Latin, helping to popularize Descartes' new ideas in the international community; he included additional notes on a theory of equations, and means of locating maxima and minima. Leibniz credited his genius,[2] and both Leibniz[3] and Newton[4] used his work in the development of infinitesimal calculus.

Although his desks were full of notes and mathematical writings, he published little, and gave up mathematics altogether by 1672.[5] In this year he was appointed as *burgemeetster* (mayor) over Amsterdam, the richest city in the world.[6] For the next thirty-one years, he was reappointed nineteen times, as often as the law allowed, fulfilling other critical roles in the interims. During this time he increased the Republic's wealth, often with recourse to his mathematics training. He used hull displacement calculations to convince Danish traders that their tariffs were too high;[7] he compared a century of mortality statistics to rebalance profitable life annuities;[8] he funded and aided Christiaan Huygens in the development of a marine clock so trading ships could know their latitude at sea.[9] He was known as a fair, generous, and brilliant leader.[10]

Figure 40
Eenhorsluis, Amsterdam

One of his first innovations, however, originated at the beginning of his political career. In 1675, within a few years of his first appointment as *burgemeetster*, a great flood swept through the north of the Netherlands, including the area surrounding Amsterdam. In the six decades since 1613, Amsterdam's population had more than quadrupled, and its citizens were vulnerable: the storm surge devastated homes, businesses, ports, as well as vast areas of outlying farmland.[11]

As the city repaired itself, Hudde recognized the value of a new building standard. He had systematic measurements taken of the high water mark in the IJ River north of Amsterdam. Taking the average of these, he defined a zero-reference, calling it the *Stadtspeyl* (City Datum). Eight marble blocks were cemented into the walls of the sluices that controlled the flow of water between the IJ and Amsterdam's canals. Each block had a horizontal groove, and an inscription:

ZEEDIJKSHOOGHTE ZIJNDE NEGEN VOET VYF DUYM BOVEN STADTSPEYL
Sea dyke's height is nine feet five thumbs above City Datum

'Nine feet five thumbs' (inches) was Hudde's elevation reference for dyke building, indicating where raising and reinforcement was required. The Datum gained a second use in sanitation, allowing Hudde to predict when to effectively flush out the canals. And finally, the *stadtspeyl* was of course readily applicable in the regulation and building of foundations.[12]

Figure 41
Huddesteen ('Hudde's stone') at Eenhornsluis, Amsterdam.

Hudde's stones, placed where canal water meets seawater, made visible what was inherent and intuitive in the history of Netherlands foundation-building. The waterline is the critical condition, and elevation the critical dimension. The continuous function of water plotted against the datum of a flat landscape tells a story of construction; the interface of water and ground is a site of preoccupation.

The plane where water, land and architecture meet is dense with centuries of human investment. Generations did not build successively, vertically, but constructed intensely at this level. They worked around, between, and sometimes in the same spaces as their ancestors. In Rome, foundations were built once, emphatically, but Dutch ones invite continuous engagement. Builders in the Netherlands were unable to simply make structures heavy, having instead to balance with soft soils. They could not wholly accept the ideology of permanent foundations that dominated western European culture, but regarded foundation-building as an intergenerational task, replacing enduring materials with ongoing maintenance at the *stadtspeyl*.

The Dutch word *grondslag* implies a relation between the ground plane and labour. On the one hand, the term can be rendered *gronds-lag*: 'ground layer'. Equally, the word evokes a sense of exertion upon the ground as *grond-slag*. Hudde's level is a reference in the waterland, and it also delineates a locus of concentrated effort.

The critical conditions for which builders laboured were often imagined. Builders seldom worked on a substructure directly or as it was, but rather as it could be, or as they envisioned

Figure 42
In some city districts, the difference in elevation from waterline to steet level to floor of a home may be no more than 50mm. Turfmarkt, Gouda

it. Farmers piled six- and eight-meter high *terp* mounds in flat landscapes, anticipating the height of flood water while the sea was barely visible on the horizon. Unlike in Rome, where excavation allowed direct, visible installation of substructures, centuries of Dutch pile drivers worked in a world that was unseen and inaccessible. They constructed the foundations and surrounding strata in their minds as they toiled in reality; the act of foundation-building was simultaneously physical and abstract. Likewise, many current foundations are predicated on speculation where certainty is impossible. Probability and optimization—Hudde's 'mathematics of fluxations'—are used to design foundations that anticipate future sea level rise, or minimize interference with unseen and uncharted archeological artifacts concealed in the watertable. Inherently, in a fluctuating waterland, foundation-building is an imaginative act.

It is fascinating to observe how continual investment in the imagined environment below the *stadtspeyl* is reflected in the ornament above it. The richness of the tactile city has been wrought, to a great extent, through continual reworking of the ground. Ever-changing foundations have stimulated the evolving form of the city. From imagined conditions, builders derived imaginative solutions below grade, and this creativity presents itself above Hudde's mark.

Although submerged and inaccessible, foundations make themselves felt. In the Netherlands, buried foundations manifest themselves in visible details of architecture.

Figure 43

The steep slope of Hegebeintum terp in Fryslân is a part of the architecture of the village church.

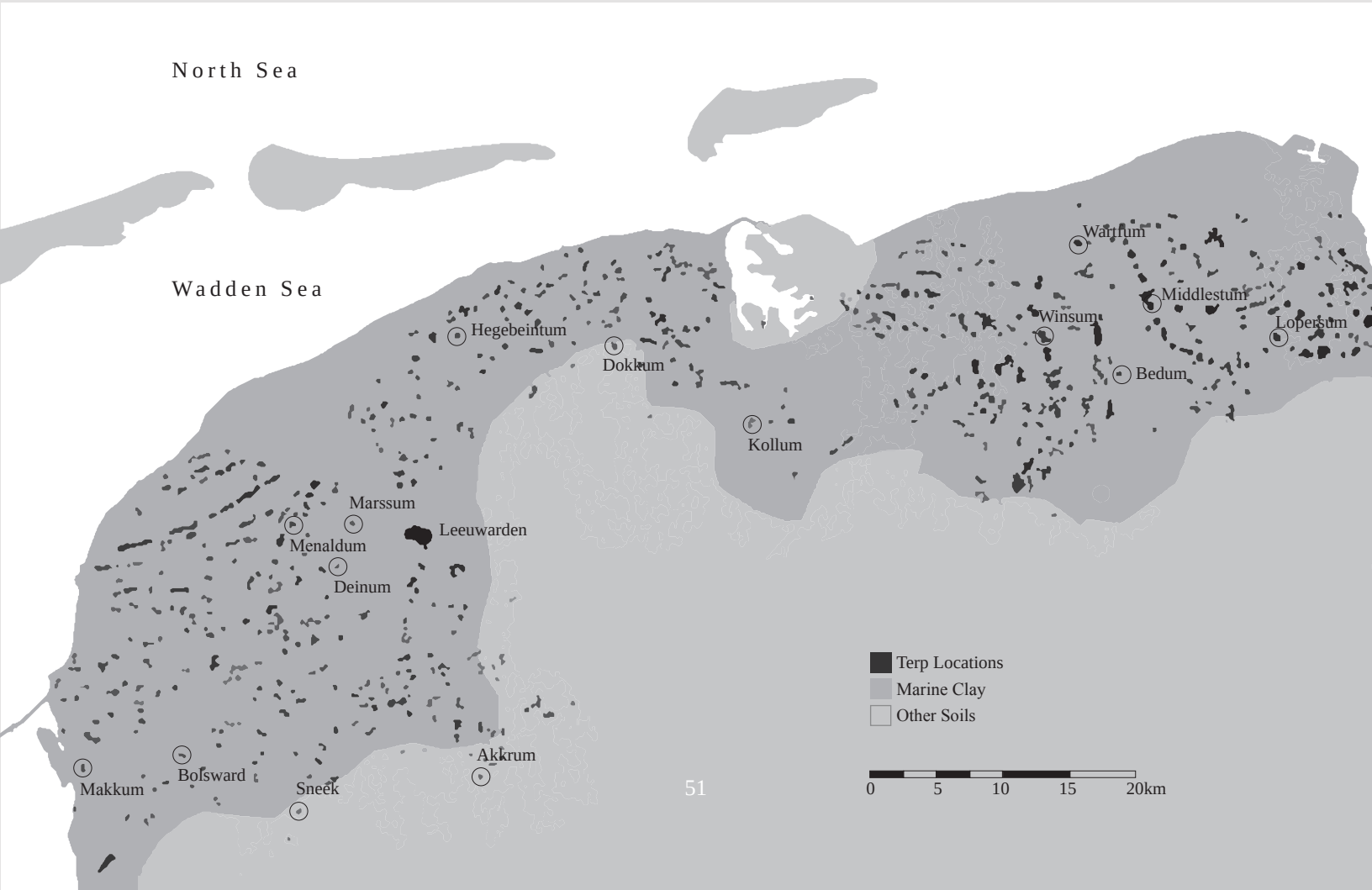
They foster urban forms, and even influence the social structures of cities. Foundations are structures of the surfaces we touch.

The oldest foundations on the coast of the Netherlands demonstrate the potential of foundations to transform environments over a long term. These substructures were built of earth: the same fertile soil that attracted early farmers to the edge of the delta provided material to elevate their dwellings above the sea. The man-made mounds were called *terpen,* and the earliest layers of the oldest mounds date from 500 BCE.

The *terpen* were built where the land was naturally high, for instance on river levees. Maps of known *terp* sites still approximate the ancient paths of rivers.[13] Along these river shores, however, the original topography was greatly augmented. Sometimes when an earth mound was flooded, it would be abandoned, but most often it would be added to. By the middle ages, some *terpen* sites reached heights of over 6m above sea level. Hegebeintum in Fryslân is 8.8m above sea level, and is among the oldest of the terpen, its lowest layers dating from before 400 BCE.[14] Centuries of waste, dung, as well as intentionally cut and placed peat allowed the mounds to grow organically, in pace with the needs of growing populations.[15] Farmhouse *terpen* grew until they joined with other *terpen*, creating villages; village *terpen* grew and joined to create towns and cities, resting entirely on the same ancient bases.

The forms of the early *terpen* have shaped the layouts of later communities. The oldest

Figure 44
Terp sites approximate the paths of ancient rivers.



terpen, built to hold farmsteads, were circular in plan to maximize elevation above ground, while later *terpen* built along sea inlets were constructed in oblong shapes so that boats could moor alongside them for trade.[16] These shapes are still reflected in the patterns of contemporary streets and buildings.

Earth mounds were rarely a simple convex form. Most *terpen* were designed with a depressed area in the centre. Rainwater collected in this depression, providing the farmstead or village with freshwater, safe from contamination of seawater at high-tide. The *put*, or well, was a vital point, and was the one place that was never originally built upon.[17] Dykes, built coincident with the spread of Christianity in the region in the 9th century, were built between the *terpen* and made the special form of the *terpen* redundant: because of the seawalls, the *put* lost its role as the single protected source of freshwater. Subsequently, when early Frisian Christians built their first churches, they were built on the unoccupied, high, central, and symbolic place of the *put*.[18] Ancient foundation-building directed urban form.

Larger dykes built closer to the sea ultimately made the *terpen* themselves redundant. In the mid-18th century, *terpen* began to be mined as a source of rich soil to supplement the sandy agricultural land in the province of Drenthe.[19] Houses were demolished or moved to access the more valuable material below. Only the churches and their cemeteries were exempt from destruction—although soil was such a valuable commodity that sometimes excavators cut too close to the cemeteries, leaving bones protruding visibly from the steep earthen walls.[20] The foundations had once protected the buildings and the buried from the

Figure 45

Churches and cemetaries defined the limits of terp excavations, shaping the forms of villages. Hegebeintum, Fryslân.

tide; now the presence of the churches and cemeteries protected the foundations.

From arduous labour arose forms which made habitation of the floodplain possible, and allowed the settlement and cultivation of the region. The work and the benefits of the foundation-building were shared among neighbours as the *terpen* grew together into villages and towns. More uniquely, however, both the effort and the profit of foundation-building were shared among generations. For centuries, families participated in the laying of the foundation, adding to the dedication of their forbearers and participating in a collective culture. Traces of this foundation-labour persists, as today the *terpen* are visible in the flow of streets and the locations and arrangements of towns, cities, and churches. Strong, steeply excavated slopes are essential to the reading of architecture in rural Friesian and Groningse villages. Through the manipulation of the boundary between inundation and dry ground, millennia-old *terp*-builders composed the environments that many Netherlanders inhabit.

When the Romans came to the Netherlands at Germania Inferior, they brought with them a different ideology of what a foundation should be. They located only where they could construct the kind of foundations that they envisioned would last. The ancient Romans built emphatically,[21] not gradually, and this had an influence on the environments they created at their frontier.

Although ancient Romans had techniques for founding buildings in marshes when

Figure 46 (left)
The subtle slope of an alley in Bosward infers the effort of past generations.

Figure 47 (right, high)
The street layout in Leeuwarden follows the topography of the terp beneath.

Figure 48 (right, low)
The form of the village at Hegebeintum revolves around the excavated terp mound.

necessary, saturated bogs at sea level were not probable sites for Roman settlement. More frequently, the Romans' pile-driving techniques were employed for infrastructural projects, such as roads, bridges, and aqueducts, on the unavoidable routes between places. Exceptions include the cities of Ravenna, Altino, and Aquileia, which cleverly used the sea tide to periodically cleanse the marshes with salt.[22] Buildings in such cities were sometimes built on patterns of char-preserved piles driven densely together to compact the soil; nevertheless, these cities were built well above the high water level.

Military forts naturally grew along Rome's defensive *limes*, but civil settlements at the borders of the empire were typically founded on the least complicated and most stable sites available. Roman settlements in the Netherlands are found at naturally high areas, usually of sandy soil. Towns grew according to a classical model, with urban form, orientation, types of buildings, and organization directed by precedent: so too was the manner of founding. Propagating a message of permanence and civilization, established settlements built their foundations of stone. At great expense, tufa was imported from Germania Superior (specifically, south-western Germany).[23] In the Dutch Middle Ages, this stone was considered so valuable and its presence so rare that known Roman sites were completely quarried to the bottoms of their foundations, leaving no building remains intact.[24] For the Roman world, however, tuff stone was a familiar substrate, compatible with Roman identity.

In 'Natural History', Pliny mentions the mud foundations of his contemporary neighbours in the north when he contrasts their culture with his own.

Figure 49

Installation at *De Bult* ('The Hump'), modern Rijswijk, showing successive Roman foundations on the site. The oldest remains date from 25 CE; tufa stone foundations were built during the second and third centuries CE.

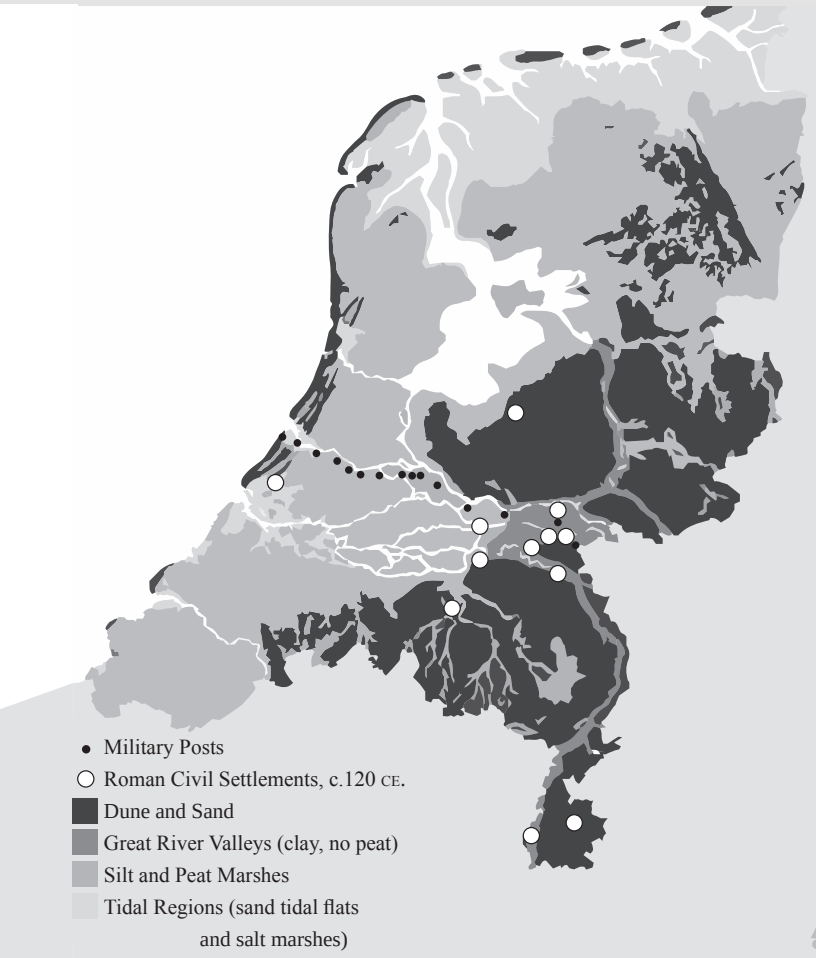
> [We have seen] the races of people called the Greater and the Lesser Chauci … in the north. There twice in each period of a day and a night the ocean with its vast tide sweeps in a flood over a measureless expanse, covering up Nature's age-long controversy and the region disputed as belonging whether to the land or to the sea. There this miserable race occupy elevated patches of ground or platforms built up by hand above the level of the highest tide experienced, living in huts erected on the sites so chosen, and resembling sailors in ships when the water covers the surrounding land, but shipwrecked people when the tide has retired, and round their huts they catch the fish escaping with the receding tide…And these are the races that if they are nowadays vanquished by the Roman nation say that they are reduced to slavery![25]

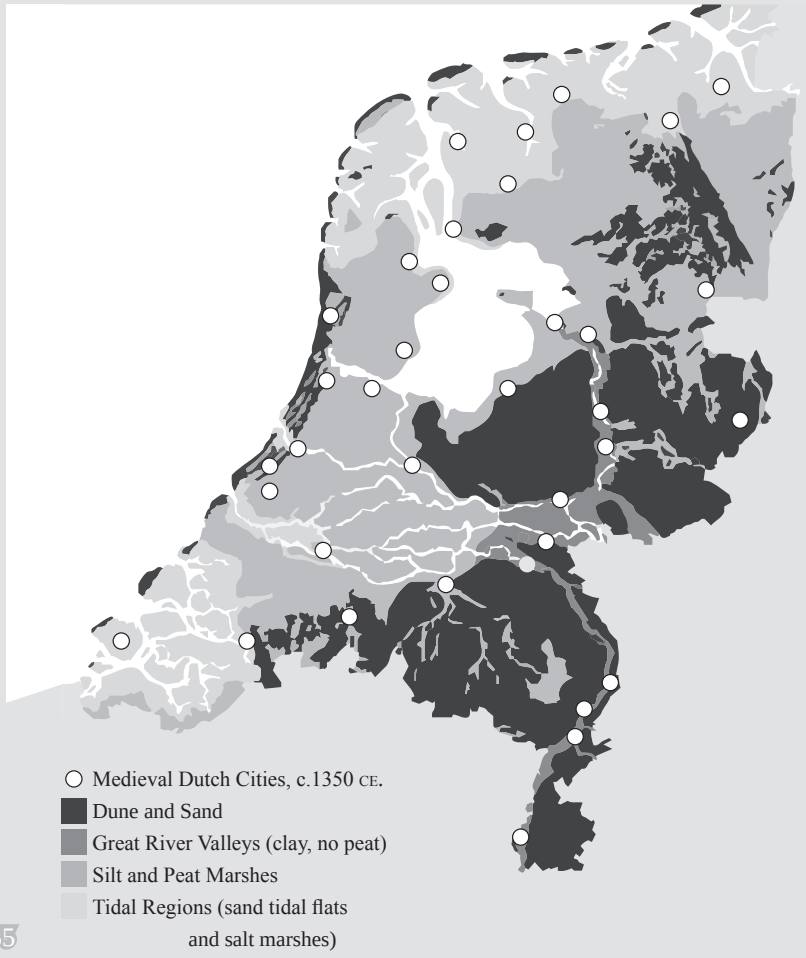
Suitable land extended only as far as the Romans' ability to found in their preferred manner, and their attitude influenced the degree to which they transformed the limits of their frontier.

Early medieval Dutch had neither the resources nor the ideology to build such lavish foundations as the Romans had. Neither could they be so scrupulous with their settlement locations: many trading and fishing towns inevitably developed near the sea and large river confluences where the soil was typically soft. While the Romans had invented means of building with piles in local areas of soft soils, over the centuries the Dutch developed their own techniques, applying them boldly in founding entire towns atop wooden poles. Imaginative foundations transformed villages into cities.

Figure 50 (left)
Roman Civil Settlements and Posts overlaid on Paleography of Netherlands c.120 CE. .

Figure 51 (right)
Significant Medieval Cities overlaid on Paleography of Netherlands, c.1350CE.





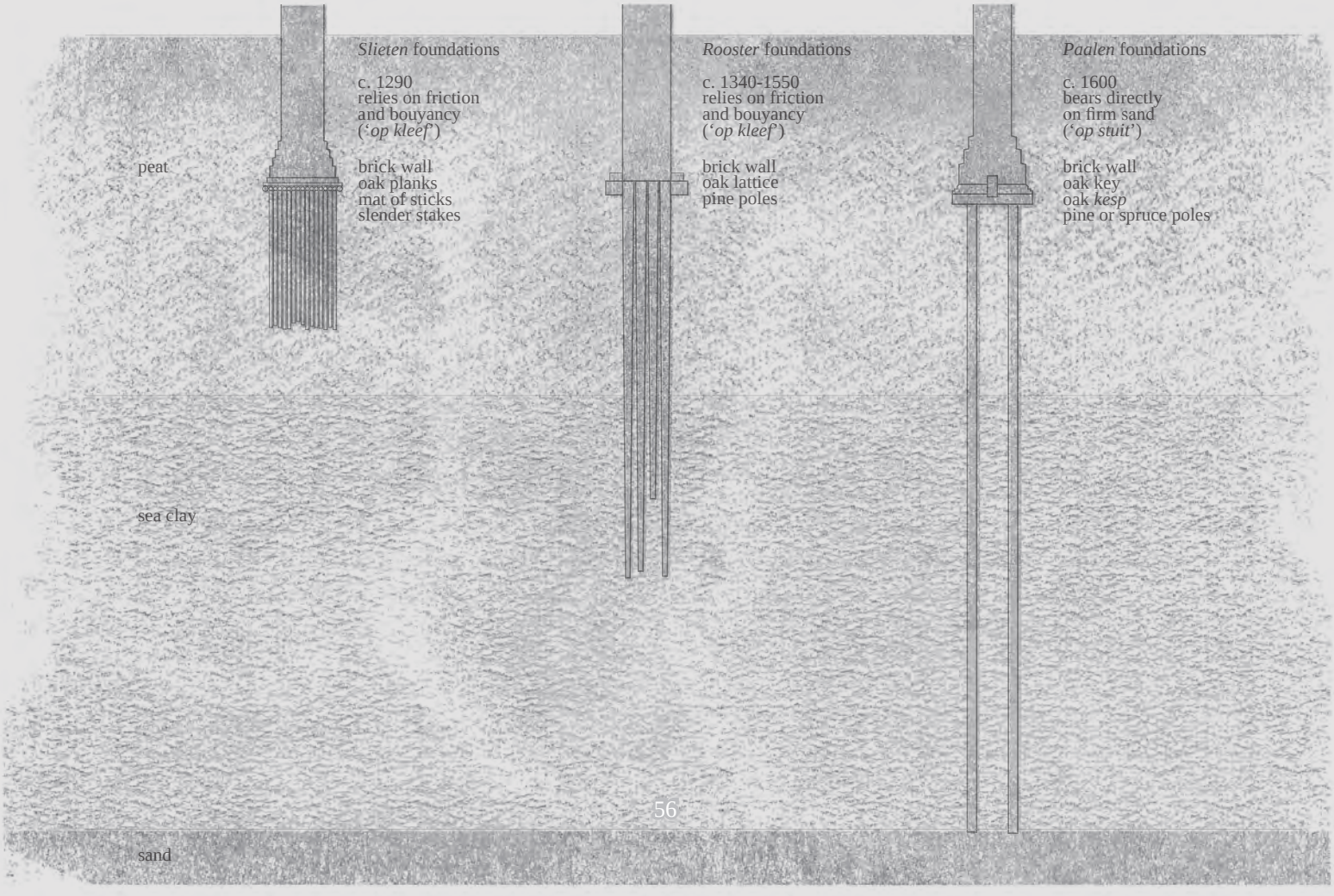
Amsterdam is one such city. The settlement began as a fishing village in the Middle Ages, near the dam of the Amstel River. The first houses were light wooden structures framed from poles embedded in the earth, without footings. The timber rotted quickly, and the poles sank into the boggy soil and had to be periodically raised. By the 14th century, builders began founding the wood posts on masonry blocks.[26] This kept the base of the pole drier and helped the structures last longer, but the problem of weight remained.

As the ambition to build large buildings grew, the techniques of foundation-building developed as well. A significant technological leap came with an inversion of the more intuitive foundation system. Instead of installing posts on a masonry footing, craftsmen built a masonry superstructure on wood posts. Instead of keeping the wood out of the water, the posts were completely submerged, preserved from rot in the anaerobic bog.

The Oude Kerk is the oldest building in Amsterdam. Its interior is also the oldest unmodified public space in the city.[27] Beneath it, centuries of construction, additions and repairs record the early history of the Dutch tradition of pile driving.

The oldest parts of the church, from 1306, were founded using one of the earliest and shallowest pile techniques in the city. Trenches were dug in the peat-soil of the site, laid out in the proportions of the basilica. On each side of the trench was laid a slender length of alder wood called a *sliet*. Between the *slieten*, pairs of men worked simultaneously with heavy wooden hammers to drive two meter long stakes into the peat. Eventually the entire area of the trench between the *slieten* was filled with these stakes. Small sticks (*slietjes*)

Figure 52
Early wood pile foundations: section. 1:100.



were laid over the tops of the stakes: one layer longitudinally, and then another layer laterally, providing a roughly level surface. Thick oak planks were laid on top of the *slietjes*, bridging the entire assembly. Brick walls were cemented to the oak planks, rising above finished grade while the entire wood assembly remained in the wet oxygen-less peat.[28] This principle and this assembly are similar to systems the ancient Romans devised for temples in modern-day Elst, near Nijmegen in the Province of Gelderland.[29]

This type of foundation improved the consistency of the substrate, but did not really increase the foundation's bearing capacity, as the stakes did not reach a denser layer of material. Within half a century of construction, the church underwent its first renovation. The aisles were extended to wrap in a semi-circle around the choir, improving its stability.[30] The new foundations were based on the same design as the previous technique, but with larger pieces of timber. Five to seven meter long poles were densely bundled between an oak 'lattice'. This joined oak lattice replaced the assembly of *slieten* and *slietjes*, and allowed the brick wall to be built directly on the tops of the larger pine poles.[31]

These *slieten* and *rooster fundering* ('slat' and 'lattice' foundations) allowed larger constructions than had been previously possible, but they still had limitations. They were a form of *op kleef* foundations, relying on the accreted friction of the surrounding peat and clay for support. They did not bear on a stable substrate, and the weight of the church had to literally be balanced with the buoyant upward force of the bog.

Such limitations had apparent influences on the architecture of the church above ground,

Figure 53

Trekbalken (wood tension beams) restrain the thrust of vaults, in place of heavy buttresses.

beginning with the materials used.

There is a gradient in church construction material from west to east in Holland. In the east, where the ground is more solid, churches make greater use of brick and stone vaulting. In the west—ironically, where river clay for brick is readily available—builders relied on timber from further east to frame the roofs of their churches. Timber is necessary because vaults of masonry could not be supported by the foundations. Carpenter's guilds enjoyed a surprising high level of prominence and authority in medieval brick towns such as Delft and Amsterdam, because they were the only ones capable of enclosing large spaces lightly.[32]

The Oude Kerk's wooden vault from 1390 is the largest medieval wooden vault in Europe, necessarily light because of the waterland on which it is placed. The original planking, imported from Estonia, has a profound affect on the quality of sound in the church. The wooden ceiling, in great part a consequence of the soil, contributes to some of the finest acoustics among church buildings in Europe.[33]

As well as influencing material choice and trade, the influence of the guilds, and the acoustics of many of western Holland's medieval churches, the limitations of these early foundations influenced architectural space and details. Heavy ornament, typical in other Roman Catholic building traditions, was stripped away in the Netherlands to minimize weight. Large area of glass and fine stone tracery brought in light from Holland's overcast skies, but they also minimized the volume of masonry pressing upon the soft earth. Towers tended to be plain vertical masses, without even a taper, topped by a light wooden spire.

Figure 54

The wooden vaults of Amsterdam's Oude Kerk, designed to keep the buildings light upon the soft soil, contribute to the fine acoustics of the space.

Vaults were not supported by flying buttresses, but by simple interior *trekbalken*, or 'tension beams' of wood.[34] Instead of letting the thrust spill outwards, forces were kept within the building, transferring loads simply and vertically to the unindulgent ground.

The often remarked-upon sobriety of Dutch architecture may find a cause in the early necessity of eliminating heavy adornment. The typical Dutch aesthetic of 'restraint' is, in this church, directly derived from the need to contain structural forces within the building, rather than lavishly conveying them outwards.

Later generations of Amsterdammers disregarded the limitations of the foundations at the building's peril. With advances in end-bearing piling, the past concern for achieving structural lightness diminished. In 1565, an open lantern was installed on the tower of the old church. It was clad in lead, and raised the height of the tower from 35m to 70m. Unfortunately, the tower was the oldest part of the building, resting on the earliest, *slieten* foundations. With the extra weight, the tower body began to sink, slowly tilting to the north over the course of decades. By the 1700s the problem had become acute and in 1738, structural renovations began. End-bearing piles were driven into the ground inside and outside of the tower, on top of which was erected a brick 'mantle' above grade. The old tower effectively 'hung' inside this new weighted base, supported by new, end-bearing piles.[35]

The new piles were a form of *op stuit* foundations, whereby longer piles reached all the way to a hard layer of sand 12.5 meters below the city, replacing *op kleef* techniques

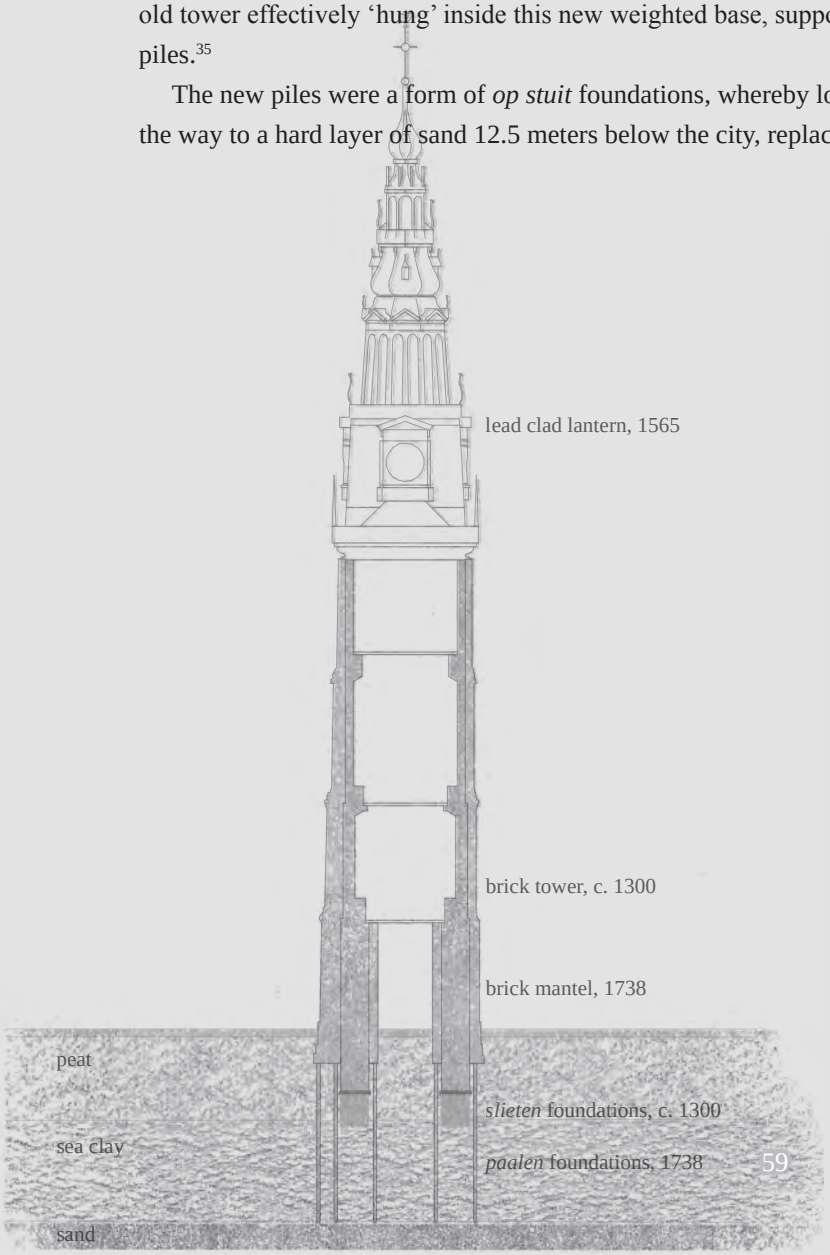


Figure 55 (left)
Tower of the Oude Kerk: section. 1:500. The dark brick pattern shows the original structure, which rests on *slieten* foundations. After an open lantern was installed in 1565, new piles had to be driven around and inside of the existing structure to support the load. A new brick mantle, shown with the lighter brick pattern, directed the load to piles bearing on firm sand.

Figure 56 (right)
The Montelbaanstoren tilted dangerously in 1610 after a lead-clad lantern was installed. As at the Oude Kerk, deep piles and a visible brick mantle helped steady the structure.

which relied on friction. Gangs of pile drivers, called *heiers*, operated *heistelling* machines which lifted and dropped heavy blocks on the ends of the piles. The *heiblokken* weighed approximately 450 kg (1000 pounds), and would be lifted by as many as forty men, while two men held the pile plumb by means of leashes. Because each pile had to be driven in perfectly vertically, the whole apparatus of tripod, leaders (*leiders*), and guy wires (*tui*) had to be moved with each pile. These new foundations allowed larger structures, but represented an incredible amount of work.[36]

Already in the 1400s, pile driving began to be closely regulated. By 1503, it was forbidden to install a new foundation on a public road without the authorization of the *rooimeesters* ('alignment masters'), who carefully ensured the building facades would line up neatly along the streets.[37] After 1528, no construction within Amsterdam was allowed to be started without official permission. An *overheier*, or 'pile-driver overseer', had to approve every foundation, organizing the city by controlling the rows of piles.[38]

Figure 57

After 1503, Amsterdam required *rooimeesters* ('alignment masters') to approve each foundation and ensure that building façades lined up neatly along the street edge.

Even with an official overseer, pile tops sometimes extended above the water level, and in some cases above the ground itself. The piles rotted where they were exposed to air, and the superstructures failed. From 1638, the government decreed that the wood part of the foundations must lie half a foot beneath the water.[39] Foundation regulations kept pace with the increasing complexity of the building projects attempted.

The 17th century was the Netherlands' Golden Age. In 1648, construction began on a Town Hall for Amsterdam, then the richest city in the world.[40] The building was inspired by

Roman public buildings, resonant with the popular contemporary image of Amsterdam as a Rome of the North. Yellow sandstone from Germany was imported for the exterior, and ornate marble sculpted throughout the interior. At the time it was built, the Town Hall was the largest administrative building in Europe.

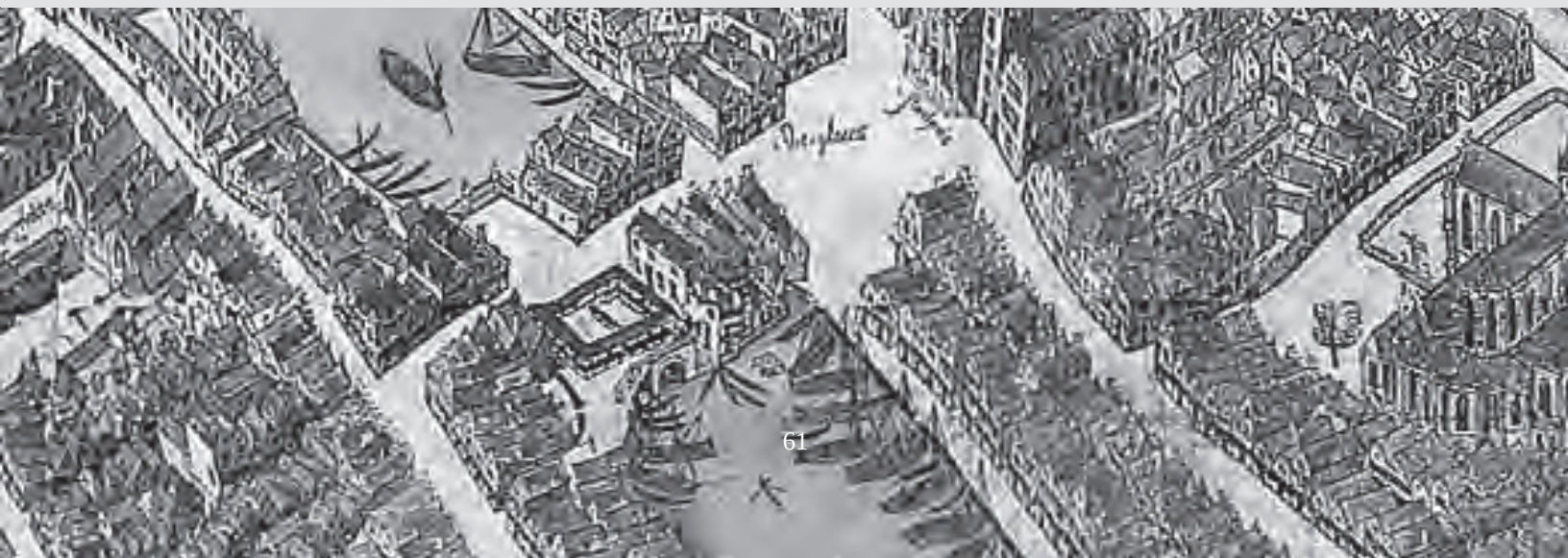
The building was founded upon the site of the original dam of the Amstel River, for which Amsterdam city is named. The town square in front of the building is referred to as Dam Square, or, in Dutch, simply *de Dam*. To support the seven-storey building, builders drove 13,659 wooden piles in an area of approximately 4800 sq. m.

In 1808, the Town Hall was taken over and converted into a palace by Louis Napoleon, newly appointed as king over the Netherlands by his brother Napoleon Bonaparte.[41] Thanks to his investment, the building remained one of the most richly furnished buildings of the period. When Napoleon Bonaparte himself took over the palace, he continued to endow it elaborately, as Amsterdam was considered one of the three capitals of the French empire, together with Paris and Rome.

Despite the expense and expertise lavished on the building, the Palais op de Dam still registers traces of its basic earthly bearing. The wooden piles from 1648 were driven at a fixed offset from each other, and not based on the actual applied loads of the structure. Because of this, the palace has settled unevenly. This effect is most evident in the magnificent galleries around the two courtyards, where the floors slope down away from the courtyard towards the more burdened interior walls.[42]

Figure 58 (above)
Sloped floors in the Palais op de Dam

Figure 59 (below)
Location of the Palais op de Dam, on the dam of the Amstel River. Detail from *Vogelvluchtkaart van Amsterdam*. Cornelis Anthonisz. 1544.



Despite allusions to Rome and French embellishment, the Palais op de Dam cannot belie its site. The marble decorations which honour the Netherlands as a sea-trading nation are given subtle but profound endorsement by the effects of the subsiding soil. The dipping floors and ceilings become an important part of the architecture, registering the palace's significant location on the Dam through the foundations.

The era of the 19th century is known as the Netherlands' Second Golden Age. This period of renewed prosperity was driven in large part by steam, as engines drained new land for agriculture, dug more efficient canals to major ports, and powered rail travel between Dutch cities and the rest of Europe. Steam offered power, but the surrounding peatlands demanded extraordinary dexterity and creativity in pile-driving as the city expanded.

To considerable controversy through the 1870s,[43] it was finally determined that Amsterdam's Centraal Station railway should be located at the head of the city, centred within the three historic rings of canals and adjacent to shipping traffic of the IJ River. Tests revealed, however, that the hard substrate of sand at 12.5m below the city, used for end-bearing piles, had been eroded by the IJ. To achieve the symbolic and efficient layout that the Ministry of Transport desired, a new piling technique was developed. Builders joined two wooden lengths to reach a second layer of sand at 24m depth, in a manner that ensured that the piles stayed centred and vertical. They became well-versed in this new procedure, as the

Figure 60
Amsterdam Centraal Station, with IJ River visible beyond

new train station required approximately 8,700 piles to achieve the vision.[44]

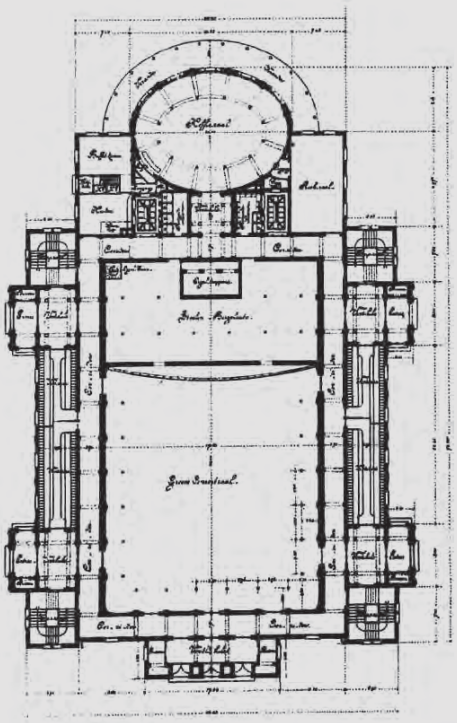
On the other side of the city, in the south, the Concertgebouw represented another example of boldness in claiming new territory for the city. Wealthy businessmen decided Amsterdam needed a music hall, and chose to found their project in the peat pastureland outside of the city, anticipating further development.[45] The extensive story of the Concertgebouw demonstrates the continued mutual influence of visible architecture and buried foundations, and underscores a curious inversion typical in the Netherlands, where the superstructure can be the resolved work of a moment, while the foundations are the work of generations. Often, the ground must be worked to an extraordinary degree, simply to maintain the existing ornament of the city.

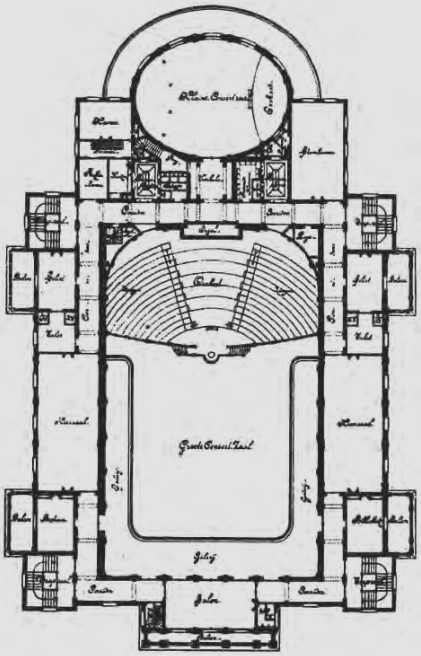
The Concertgebouw is considered among the three best concert halls in Europe.[46] Constructed when acoustics were based on empirical knowledge and intuition, the sound of the Grote Zaal has received a century and a half of acclaim from musicians, conductors, sound engineers and audiences.[47] The hall's attendance is second highest in the world, after Renzo Piano's Auditorium Parco della Musica in Rome.[48] 850,000 visitors come to eight hundred performances yearly,[49] up from the 60,000 annual visitors for whom the hall was originally intended.[50]

The concert building was drawn by Dutch architect Adolf Leonard van Gendt. His neo-

Figure 61
Gewandhaus Concert Hall in Leipzig: plan. 1:1000.

Figure 62
Concertgebouw in Amsterdam: plan. 1:1000.





classical design was strongly influenced by the contemporaneous Gewandhaus Concert Hall in Leipzig, Germany. Although the buildings shared initial similarities, the concert halls were modulated according to the soils upon which they were founded. In 1883, while German builders completed the final year of construction on the stable soils of Leipzig,[51] Dutch *heiers* began driving poles into the pastureland outside of Amsterdam. 2,186 wooden piles were sunk into the soft peat in preparation for the grand brick music hall.[52]

Unlike the Palais op de Dam, the piles were sized and spaced to take the hall's calculated loads. Centuries of experience had taught the Dutch to drive the piles to approximately 12.5m below the Hudde's datum, since renamed the *Normaal* Amsterdamse Peil (NAP). At this level, the wood could end-bear on a hard layer of sand. Tests using long piles and steam engines were a part of the building procedure.[53]

Construction of the superstructure did not begin until 1885. In the meantime, some aspects of the design had changed. Significantly, the walls of the *Grote Zaal* (the Great Hall) had been changed from *steen* to *spouw*, that is, from one wythe of brick to two wythes with an airspace in-between, for the novel technology of central heating. Although the new wall assembly was twice as heavy, the design of the foundation was not altered to accommodate the weight.[54]

The Concertgebouw opened in April of 1888, with an orchestra of 120 musicians and 500 singers.[55] In subsequent years, the great organ was installed, and material and ornament were applied to the interior of the hall to tune the reverberation time, resulting in excellent

Figure 63

Concertgebouw shortly after construction in the peatland outside of Amsterdam

acoustics.[56]

Shortly after the opening, however, it became apparent that the walls around the Grote Zaal were sinking. The cracks were replastered and brickwork repaired, but the descent continued. Regular maintenance kept the effects of the settling out of the public eye. The reason for the cracking was neither determined nor sought.[57]

After over fifty years of service, the wooden floor of the Grote Zaal deteriorated and needed replacing. A concrete floor was cast, with a basement dug and a corridor set on the north of the building, to provide preparation space for visiting musicians. The renovation gave a good opportunity to assess the state of the hall, but nothing was done to limit the settling.

In the 1970s, technicians began to log each crack in the auditorium before it was repaired. It was difficult to quantify the settling, because by this time there was no original fixed point (*vastpunt*) from which to measure all the variation.

In the 1980s, as the building approached a century of musical performance, the effects of the settling accelerated. The directors finally requested an investigation to determine a solution.

When the issues with the Concertgebouw became public, not everyone was in favour of a renovation. Some citizens of Amsterdam proposed it would be better to demolish the Concertgebouw and build a modern concert hall, rather than attempting a costly repair of the building's foundations.[58] Preservationists' arguments were given weight by the Hall's special

Figure 64

Differential settlement of the foundations is visible in the ornament of the corridor around the Grote Zaal

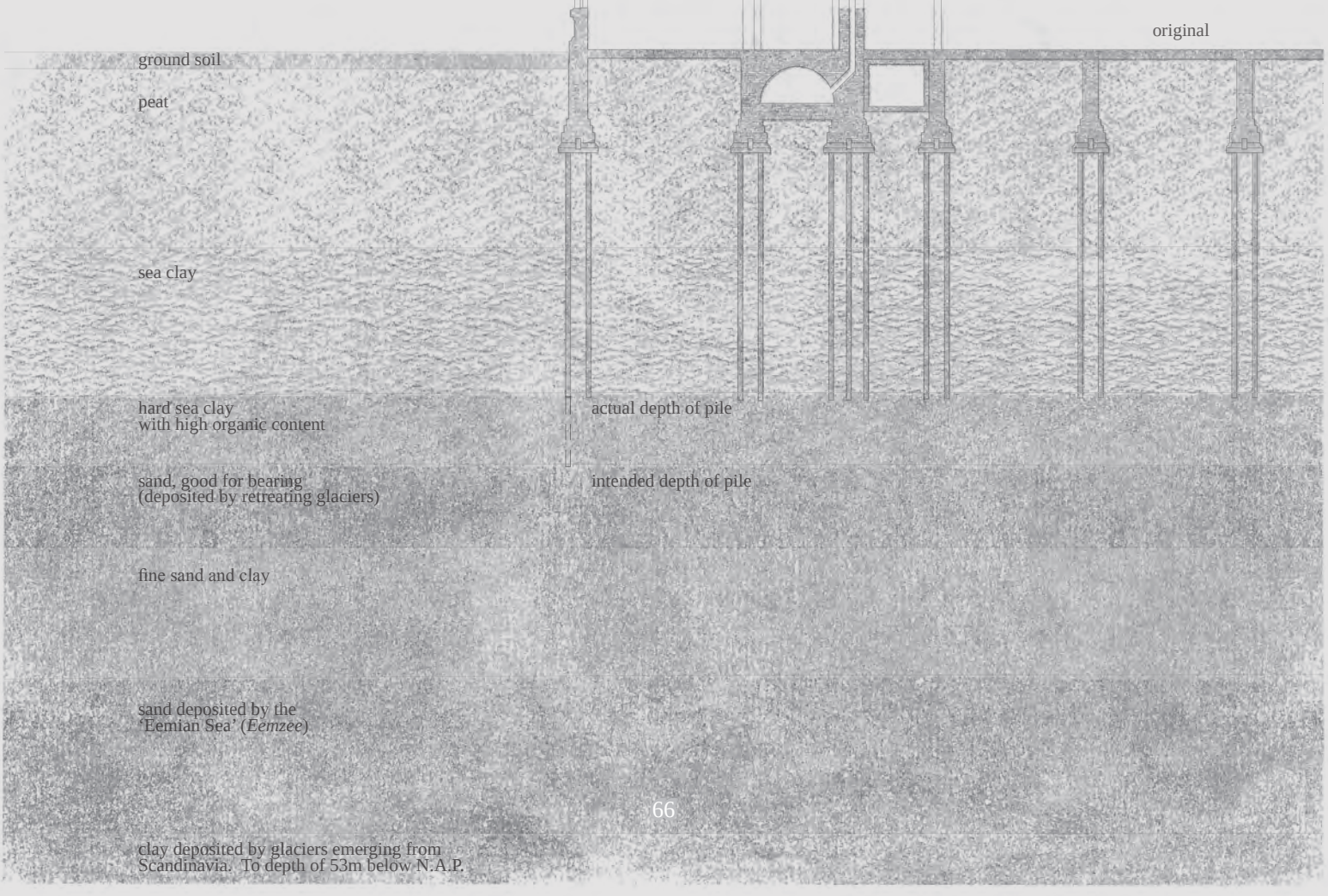
acoustics and its significance in the city's development. The still-fresh recollection that a communist government had torn down the remains of the Concertgebouw's sister hall in Leipzig a decade earlier may have helped seal the survival of the Dutch monument.[59]

A significant renovation was proposed. Of the four requirements of the renovation—reinforcing the structure, creating more space, repairing damage to the facade and interiors, and bringing the building's technology up to date—the first three were ultimately connected to the Concertgebouw's foundations. A campaign collected 35 million guilders from government, business, and individuals within a short span of time. The concert hall directors determined that the building could close for a maximum of 14 months, and assembled a team of architects, engineers, soil experts, and acousticians to preserve the exquisite building.

The consultants' first priority was to measure the existing foundations. A full reconstruction of the wooden piles was created, including locations, depths and diameters. The piles were found to have been arranged in double rows (known as *Amsterdamse paalen*), rather than single rows (*Rotterdamse paalen*), to improve the rotational stability of the *kesp*.[60]

The actual and maximum loads on each pile were calculated. Using sound waves and drilling samples, soil experts determined the profile of the soil in which the foundations stood. A layer of artificial fill of varying thickness overlaid approximately five to seven meters of peat (*veen*). A layer of old sea clay, deposited during the last ice age, lay even lower to a depth of 10m.[61]

Figure 65
Geological layers beneath Amsterdam



The layer of hard sand, good for bearing in Amsterdam, lay at 12.2m below the ordinance datum.[62] Between the sea clay and the sand, lay approximately two meters of hard, but not solid, *biaklei*, or clay with a high organic component. Research into the original contract documents and records revealed that the pile drivers had not been able to penetrate this layer, and a great number of the pine piles had been cut off at 10m instead of driving them to the full specified depth.[63]

It was thought unlikely that piles breakage was the cause of the settlement; rather, piles had continued to be driven slowly downwards over centuries through the *biaklei*. The Grote Zaal had sunk between 50 and 100mm, while the lighter outside walls were displaced between 0 and 25mm.[64]

However, the piles supporting the Grote Zaal were loaded almost to capacity: most of the piles had a safety coefficient of less than 1.6 relative to their carrying capacity, due to the unanticipated double-wythe brick walls. Both pine and spruce piles had been used, and the weaker pine piles had the greatest risk of collapse. The *kesp* beam was deflected to 100mm in places, more than half of its 180mm depth. Based on the results, the structural engineers advised beginning with the replacement of the foundations without delay.[65]

The re-founding of the building and the creation of more space were swiftly combined into a single project. In 1980, the number of yearly visitors was 600,000—tenfold the number of visitors the hall was intended for in the 1880s.[66] A large amount of space was needed, and little was available for extension in the tight urban fabric of Amsterdam. The consultants

Figure 66
Original condition and renovation of the Concertgebouw's foundation: section. 1:200.

found space by digging downwards, creating a basement under the whole complex, to avoid eclipsing the heritage architecture with an above-ground addition.[67]

Contractors began building the project by driving a dam of sheet piling around the entire building. This kept soil from moving laterally during excavation, and allowed the water level under the building to be precisely regulated. Vertical tubes located inside the perimeter of the wall displayed the height of the water for monitoring. The water table inside the *dam wand* ('dam wall') was lowered to be just above the wooden *kesp*, keeping it from rotting until the wall could be carried properly on new piles.[68]

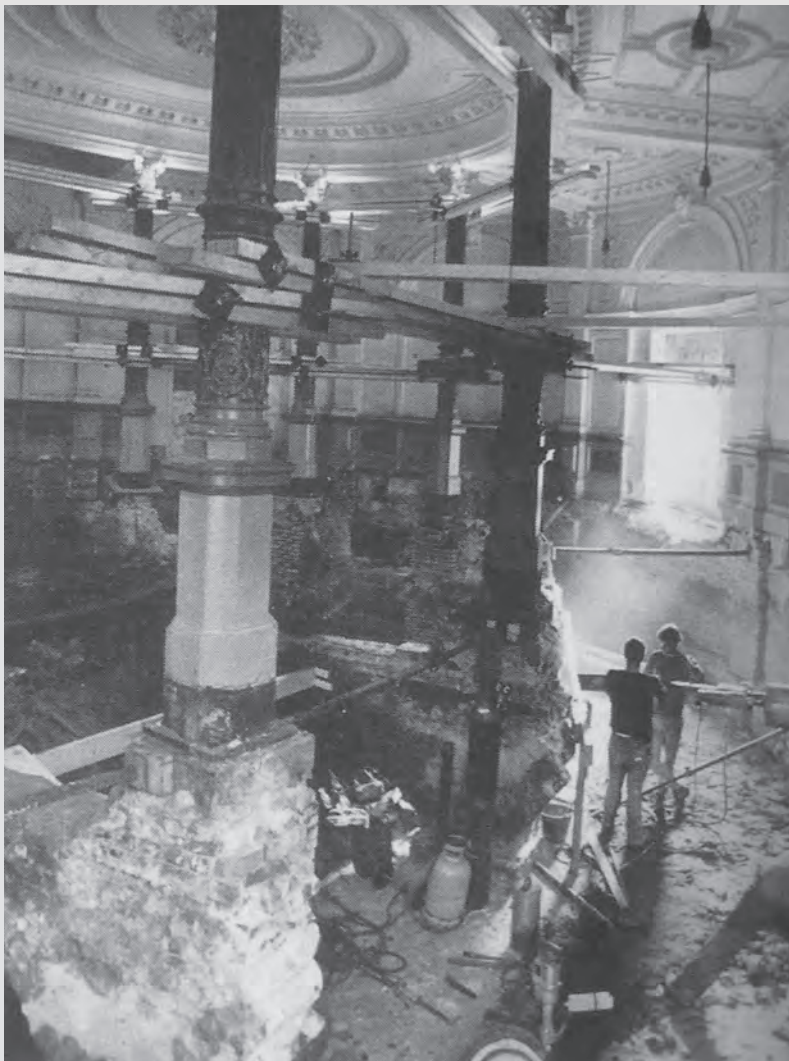
The basement was dug from openings in the gable end walls. Specialized equipment was moved into this basement space to begin driving the piles.

The restrictions on the pile driving were significant. Because of the poor condition of the masonry, driving had to be vibration-free. Pile sections had to be shorter than the height of the basement, each length driven down before the next section was welded to it, requiring several welds to make one pile of the desired depth.

The only place where contractors were able to use longer piles was in the Grote Zaal: they drilled holes for the piles in the 1950s concrete floor, making use of the auditorium's high ceiling. All other work was done entirely in the new basement: the sixteen days of drilling and pile driving in the Grote Zaal was the only period during which the Concertgebouw was closed for the entire two-year operation.[69]

Figure 67 (left)
Steel beams through outer wall of Concertgebouw

Figure 68 (right)
Temporary bracing of interior columns



Four hundred and nine new piles were able to replace the 2,186 wooden piles. Composed of alloy steel, the pipes were driven by pressure and rotation to a second layer of sand, 20m below NAP.[70]

While the old pattern of the wooden piles in plan follows the structure above it, the new piles are arranged in a seemingly arbitrary pattern. The counter-intuitive foundation plan is driven by many constraints.

The piles could not be too close to the walls, and they had to remain a minimum of one meter away from the original piles. It was important that the new piles would not change the pressures around the wooden poles, potentially distorting them. The most significant moment was when the new piles descended past the bottoms of the piles driven one hundred years earlier. If the soil at the base of an old pile was disturbed, there was a great chance that it could resettle. The engineers were never entirely able to eliminate this possibility, but the risk was considered acceptable.[71]

Once the piles were driven they were filled with concrete. Six meter long beams (*balken*) were installed on top of the piles, parallel to the walls. Shorter beams (*kinderbalken*) spanned between them, and penetrated openings in the brick foundation wall, above the *kespen*. The old foundation would continue to support the structure until the new foundations were tightened slowly against the underside of the brickwork.

A steel plate was installed in each opening. Between each steel plate and the *kinderbalken* below, the builders placed a block of very dense, rot-resistant tropical wood (azobé). The

Figure 69
Pile-driving machine in the Grote Zaal

remaining space was then in-filled with sand-cement mortar.

It is interesting that despite the modern foundations, the entire building still rested, at this moment and at one level, entirely on wood, providing a small amount of elasticity and tolerance in an otherwise highly rigid assembly.[72]

The grid of beams was lifted against the underside of the existing wall in phases, slowly taking an increasing proportion of the building's load from the wooden piles. This transfer was the most essential moment of the renovation, for which all other steps had been the preparation. This step was also the most complex, because the nature of the support of the old foundations was so different from that of the new foundation. The weight distribution was altered because of the longer spans of the new foundation; as well, the behaviour of wood piles is unlike that of 24m long steel-reinforced concrete piles. These behavioural differences were significant enough that it was necessary to transfer weight in very small incremental steps, so that deformations induced in the old foundation by the new foundation could be immediately detected and eliminated without damaging the plaster ornament above.[73]

Figure 70 (left)
Steel beams and columns through inner foundation walls of Concertgebouw

Figure 71 (right)
The cement of the original kesp visible in the Concertgebouw's basement walls

Having installed the grids of beams, and transferred load to the steel and concrete piles, the building was fully supported. Builders now worked to eliminate the portion of the steel piles that penetrated the basement space.

A steel flange was welded around each pile at the elevation of the bottom of the concrete

basement floor. A reinforced floor of up to 1100mm thickness was poured above the flanges. The depth of the basement floor was determined by the water pressure. The maximum excavation depth was determined to be 5.70m below NAP, based on the buoyant forces of the water table. While this buoyancy had supported early Amsterdam buildings, it now had the potential to endanger the stability of the Concertgebouw.[74]

On the surface of the floor, masons built up a wall to the irregular underside of the original foundation. It was necessary to use bricks compatible with the existing masonry to ensure an even distribution of stresses. The joint between the old and new masonry foundation was filled with a special mortar, which would neither contract nor compact.

The loads of the building were now transferred through walls to the floor to the piles below the floor level. The piles above the height of the floor were structurally redundant, and could be cut off, and the steel beam assembly removed. A tapered void had been prepared in the floor around each pile, and was now filled-in. The steel flange and tube provided temporary support but were considered too vulnerable in the long term: instead, the tapered void of concrete ensured a continuous load path from the floor to the piles in concrete without relying on exposed, relatively ephemeral steel.[75]

A durable new foundation now carried its hundred-year-old load, taking the complex burden gently. Three years of renovation and innovative foundation work preserved the music hall's classical detailing, even as the city grew around it. Without this effort at the foundations, the ornament would have been lost.

Figure 72
Concertgebouw, 2013, celebrating 125 years since its foundation

Between the period of the Concertgebouw's construction and the period of its renovation, Modernity began in the Netherlands. Foundations continued to influence the visible architecture through this period.

The Beurs van Berlage, Amsterdam's former Stock Exchange building, is frequently considered to be the beginning of modern architecture in the Netherlands.[76] It reconciled the tenets of the International Style with concerns of the traditionalists, with open functional spaces and strong planes as well as attention to crafted ornament.

The project was built on top of the old river bed of the Amstel River. To Berlage's frustration, the City of Amsterdam would not pay for the number of piles he believed to be necessary, installing only 4880 piles under the five-storey, 6500 square meter footprint.[77] At the building's opening in 1886 there were already cracks in the foundations and walls. The large spans were too great for the capacity of the foundations. Twenty-three years after the building had been opened, new piles were driven between the existing piers, and new brick columns were constructed to support the centre of the arch.[78] As well as giving voice to the land beneath the building, this detail is a beautiful summary of Berlage's dual ambitions, achieving an open modern space with the help of an ornament which has since become a classic detail of the building.

Sometimes the foundation manifests itself visibly in a more conscious way. Berlage and his followers in the Amsterdamse School sometimes made reference to a traditional foundation detail in their project. The *trasraam* is a dark band of brick running near the

Figure 73
Beurs van Berlage, Amsterdam

ground, visible on many old Dutch farmhouses. Darker clinker brick, cast closer to the kiln fire, were naturally more resistant to capillary action, and were used at the base of the wall in conjunction with water-resistant mortar to withstand damage due to ice, rain, and moss.[79]

In the Amsterdamse School's mass housing blocks in the Oud Zuid region of Amsterdam, the trasraam was an effective device to enforce the sense of 'unity of the block' that they desired. This conception of the city block departed from the medieval and Renaissance texture of cobbled-together façades. The trasraam also worked together with the use of light-coloured bricks, which Berlage and the Amsterdamse School favoured. Light bricks were fired at cooler temperatures and did not have a good resistance to moisture, so it was necessary to use another type of brick nearer the ground. The colour variation between the upper façade and the trasraam is starker in Amsterdamse school designs than in traditional, provincial Dutch architecture. Mimicking the trasraam gave early modernists a familiar detail to reinforce their new ideas about the city, as well as freedom in the visual tone they wished to present with their architecture.

Following the Second World War, a selection of technical innovations became newly-available. They raise the question of whether effort at the foundation still translates into ornament.

Today, many foundation systems are invisible, and carry great loads without seeming

Figure 74
'Het Schip', Amsterdam

to require compromises to visual design. Steel tube sections filled with concrete create indefinitely long piles, reaching to strong bearing layers far below the city. Deep trenches can be dug in soft soil without risk of collapse: temporary bentonite slurry resists earth and water pressures, until the slurry can be displaced by concrete. The latest metro makes use of 'deep boring', replacing the 'cut-and-cover' techniques of Amsterdam's first metro. In the old system, historic buildings were demolished along the excavated path of the Bijlmer line and replaced with new buildings founded on the subway caisson.[80] In the new process, a machine tunnels under city, continuously drilling earth, removing water, and pouring concrete for the metro line, passing within half a meter of existing pile foundations without effect on the street above.

Despite these structural solutions, however, the Netherland's soft land continues to exert influence on many of the structures that it carries. The Nesciobrug is a pedestrian suspension bridge spanning the IJ, linking the new development of IJburg to the older city. The award-winning design is an unusual choice for the Netherlands.[81] Typically, suspension bridges require firm bearing, like bedrock, to anchor the structure's main tension cables. The shores of the IJ do not offer such stability.

Gravity is no longer the problem it was for the builders of Amsterdam's Oude Kerk. Current techniques allow the vertical component forces of the bridges cables to be taken by concrete piles, weighted with concrete mass. The weight of the concrete, bearing on the second layer of sand, ensures that there will be no vertical displacement.[82]

Figure 75
Bore tunnel for the North-South Metro Line, Amsterdam

The soil cannot, however, resist the bridge's immense longitudinal forces. The suspension cables pull the concrete masses towards the IJ. Instead of trying to resist this force with the ground, the design of the Nesciobrug redirects this force through the bridge's deck. Significant aspects of the aesthetic, such as the splayed concrete paths at either end of the bridge, the layout of the cables, and the angled struts for the pylons are motivated by the necessity of using the bridge deck in compression.[83]

Like the Oude Kerk, the forces are contained as much as possible within the structure itself, making the reaction forces of the earth as uncomplicated as possible. With an array of techniques to ground buildings vertically, accommodating lateral forces in weak soil becomes a contemporary challenge for structural designers in the Netherlands, projecting the qualities of the ground onto the architecture we see.

At least two other areas of contemporary research impress changes on the city through the foundations. One of these investigations concerns the unexplored archaeology below old towns, and promises to subtly inflect the city as the Netherlands reconsiders foundations in light of their impact on the archaeological record.

The nation has had a conflicted history of preservation. Excavation for materials at *terpen* and Roman settlements have had disastrous consequences;[84] farmland and cities have been intensively manipulated and developed, destroying significant areas of archaeological

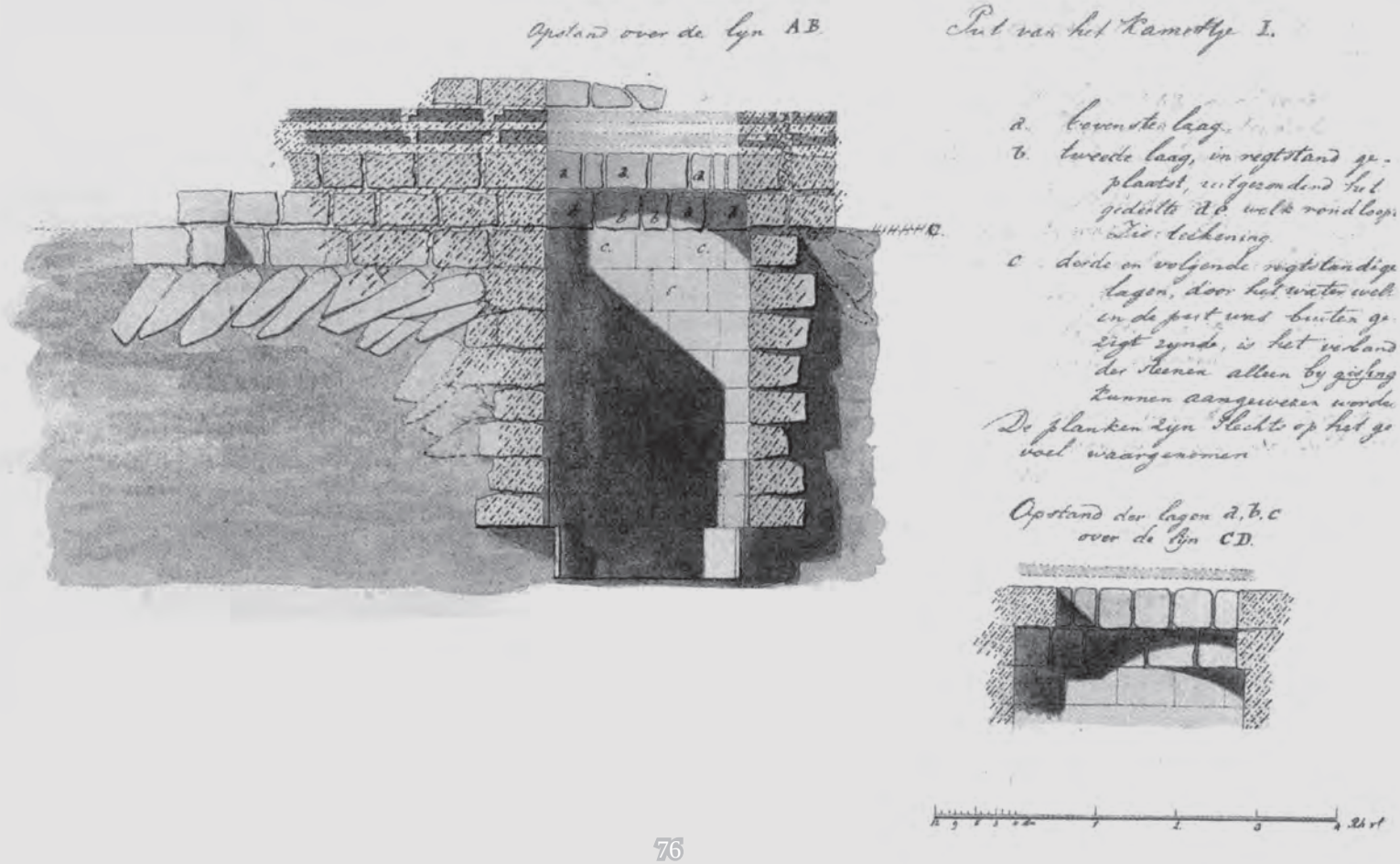
Figure 76
Nesciobrug, Amsterdam

interest. Conversely, the Netherlands has made significant contributions to the world of archaeology. Much of this impact can be traced to C.J. Reuvens, the world's first professor of archaeology.[85] Among his accomplishments, Reuvens excavated Forum Hadriani, the northernmost city in the ancient Roman Empire on the European continent, located in present-day Voorburg near Den Haag. When he began this project in 1827, it was only the third scientific excavation of a city in the world, after Pompeii and Herculaneum.

Notably, Reuvens was one of the first to make use of archaeological sections. Not only the plans but also the heights and profiles of buried building foundations were recorded during excavation. The remains were recorded with a sense of depth, including shadows and texture. His drawings and lithographs are so precise and record such subtle traces, like variations in the colour of the soil around foundations, that they are helpful to modern researchers.[86] Reuvens' notes and process set standards for archaeology, and the project marked a period of cultural shift in attitude towards the excavation and study of architectural remains.

Today the Netherlands is keen to preserve their remaining archaeology. In 1992, the Malta Convention of EU nations promoted the preservation of historical building remains *in situ* where possible.[87] The agreement is based on the advantages of *in-situ* remains in providing more context about their environment, protecting them from damage resulting from extraction, and keeping a 'collection' of artefacts and building remains together instead of parcelling them among many owners, making academic study complicated.[88]

Figure 77
Archeological plans and sections by C.J. Reuvens



In some cases, this may mean leaving the remains in the ground, unexcavated and unexposed. In the Netherlands, this option is often the best means of preserving the artefacts, as the high water table preserves wood and other materials better than would be possible in any museum or storage facility.[89]

However, other factors make the Netherlands a complex place to preserve building remains *in situ*. Development pressures are high in historic city centres, augmented by government-sponsored sustainable initiatives for urban densification.[90] The soft soil in many old towns makes deep piles a necessary part of the construction, and these piles inevitably pass through the archaeological record.

An approach is presently under development to help lay foundations in Dutch cities in a manner that minimizes disturbance of the archaeology, as well as minimizing impediment to the explorations of future archaeologists. This method originated in Gouda, where the history is old, the water table high, and new development underway.

The Koningshof is the first site where these ideas were implemented.[91] Since the middle ages, this area of the city has been the location of rope-makers, potters, and pipe-makers, chosen because of its proximity to navigable waterways and because it is on the leeward side of the city, keeping smoke and smells away from the town centre.[92] Even up until the 20th century, the site was home to the industry of the Zuid-Holland Plateel Fabriek, makers of chinaware exported around the world. Some of the façades of the Plateel Fabriek building were saved in the new development, but more interestingly, the foundations of the factory

Figure 78
Excavation, Koningshof Development, Gouda

and the rich historical record preceding it were considered worth preserving as well.

Very little is known of what lies under the Koningshof. During excavation, newspapers reported excitedly on finds beneath, failing to recognize that in this project it was desirable to unearth as little as possible. This intention put demands on the design of the building. A 500mm Archaeological Level (*Archeologische Peil*) was set, beneath which excavation was not allowed to occur. This datum precluded the possibility of basements, crawlspaces, underground garages or underground waste receptacles, constraining the programming of the ground floor and the massing of the architecture as a whole.

Other aspects of the guidelines modulate street profiles. A 'sand pack', normally required in Gouda to accommodate the inevitable subsidence of the land due to the load of the new construction, was made atypically deep to keep the underside of the foundation beams above the Archeologische Peil. In a city such as Gouda, where the water level from canal to street paving to the ground floor of a house may differ by no more than 50mm, this sudden elevation difference has a strong influence on the urban character.

Similarly, a desire to minimize interference with remains may subtly affect the widths of streets. For centuries, new walls have been aligned to old, but with new guidelines there is incentive to offset piles from the existing street edge. Contractors typically wish to avoid driving piles through brick wall remains, as it takes more energy, makes dust, and is noisy for operators and local residents; and archaeologists wish to protect the valuable record. Where cantilevered foundation beams are not possible, the new façades of city blocks must shift to

Figure 79
Visible sandpack, Koningshof Development, Gouda

avoid damage to the accumulated crust of ancient walls built against a centuries-old path. Simultaneously, however, the shift disturbs the experience and proportions of that path above grade.[93]

Most interestingly and immediately visible, the archeo-friendly approach changes the basic structural grid of the project. Designers anticipate a time when their buildings will be gone and future archaeologists search between the concrete they have driven in search of a deeper past. The reinforced concrete piles will not be possible to remove, so instead they are spaced so that a future archaeologist's excavator machine can dig between them,[94] humbly anticipating the day when the remnants beneath the building will be of more interest than the building itself.

The Koningshof project was the first archeologically-friendly development in a historic town on such a scale. The guidelines developed are presently being applied in new projects within Gouda, and are forming the basis for new building regulations in historically-sensitive areas in the Netherlands. There may be scientific, economic, and intangible values to preserving building remains in their place, leaving mystery and traces of the past under the soil of the city; and these motivations will continue to inflect the shape of the town above the ground's surface.

Figure 80
Concrete piles through brick wall, Koningshof Development, Gouda

Buoyant foundations are another contemporary influence on the configuration of the city.

The use of buoyancy in supporting foundations is not a new idea in the Netherlands. In Edam in North Holland, the oldest standing building, dating from 1530, has a floating basement. A brick box floats freely with the groundwater, once keeping merchandise dry without the complication of water-proofing.[95] Structurally, many of medieval Netherland's great churches built *op kleef* also relied on buoyancy for support. The first 'houseboats' date from the 16th century, as canal boat skippers navigated their goods and families through Holland's inland waterways.[96] Today a fixed number of 2,400 families enjoy the coveted houseboats moorings within the inner waters of Amsterdam.[97] Buoyancy has long been significant to the city's architecture.

Today, buoyant foundations again propel architectural innovation and research. Much contemporary study of floating buildings is tied with the counter-paradigmatic premise that the Dutch have taken too much land from the sea. The costs of land reclamation are high, difficult to sustain, and face particular challenges in the anticipation of rising water levels. Proponents envision reduced costs and risks in water management if buildings and cities can be designed for 'Living on the Water' ('*Wonen op het Water*').[98]

Historically, traditional land reclamation and protection in the form of polders and sea barriers have had significant social and environmental effects on existing communities. In 1455, Bolward in Friesland was granted city rights as a port city, but when its middlesea was drained for agriculture later in the Middle Ages, it became land-locked, ending its trading

Figure 81
Houseboats on the canals of Amsterdam

advantage. When the Afsluitdijk was closed in 1933, the newly created lake was separated from migrating fish stock and its saltwater gradually became fresh, drastically changing the ecology and the way of life for the many old Zuiderzee fishing villages.[99] The Flevoland polders in 1954 turned coastal villages on the north-western shores of Gelderland and Overijssel into inland locations in a period of ten years, filling the horizon with grass and trees. The social effects of such dramatic manipulations of landscape are difficult to assess.

The costs associated with water management in the Netherlands are also extremely high.[100] In 2009, the Dutch were spending 6.2 billion Euros yearly maintaining their water defence system.[101] An ancient cycle of subsidence and artifice ensures the work will never be concluded: the land sinks, as the now-dried peat collapses, and dykes must be built higher while pumps lower the water table further still. Projections of global warming add cost to the water defences: the *Staatscommissie voor Duurzame Kustontwikkeling* ('State Committee for Durable Coast Development') in 2008 anticipated increases of approximately 1.2 billion Euros yearly to counter the effects of sea-level rise.[102]

Finally, land reclamation paradoxically endangers the land it creates. In times of drought, there are not enough freshwater reserves from which to draw. Ocean water can be directed backwards through the rivers and canals for the farms, but the salt degrades the soil. Dykes, made to keep the land dry, sometimes keep the land too dry. The dykes lose their bearing in the dried-out peat: the weight of the water behind the wall pushes them laterally, breaking them and flooding the land catastrophically.[103]

Figure 82

View from De Maar, Muiderberg, North Holland. The horizon line was filled with a polder within a matter of decades.

To reduce risk, the land must become more wet, by reserving more freshwater inland and by letting the land flood in natural cycles. Since activity in the Netherlands continues to require space, proposals involving floating buildings may keep the land useable. Re-flooded polders can be occupied by floating communities, whose water foundations are siphoned as needed to mitigate the risks of both drought and inundation. River dykes can be moved further inland, increasing the maximum volume of the river and reducing the force on the barrier; the banks may be occupied by amphibious housing which accommodates seasonal changes in water level.[104]

One of the earliest attempts to test the feasibility of floating neighbourhoods was constructed as part of the IJburg district, in Amsterdam. The IJburg development is composed of artificial islands created in Amsterdam's former harbour since 2000, which provide land for schools, businesses, and an anticipated 18,000 homes. Although most of the new terrain consists of solid land, about one-quarter of one island, Steigereiland ('jetty-island'), consists of a harbour for floating houses. When the first seventy-five houses were floated in the summer of 2009, this was a first for the Netherlands.[105] Such neighbourhoods are compatible with a new paradigm of keeping the water as water, or even, in cases, giving land to the water.

Interestingly, the first building founded on the entire development was also a floating building. The buoyant IJburg Bezoekercentrum (IJburg visitor's centre) explained and promoted the IJburg development to the public when the site was still merely water, floating

in the open harbour close to the preliminary site work. At the time of its completion in 2000, this building was the largest floating building in Europe.[106] Because of its scale, and because the centre has already undergone the entire first phase of its lifecycle, the building offers particular insight in the effects of buoyant foundations on the characters of waterside cities.

Buoyant foundations influence tectonics. The materials of a floating building are selected for specific strength and innocuousness. Wood and aluminum have high strength-to-weight ratios, and glass has a high surface-area-to-weight ratio. Using these materials as structure and environmental separator departs from the brick tradition of Amsterdam, but minimizes a foundation's depth—in this case, draft. Non-synthetic materials are preferable, as any toxicity will immediately enter the water, unfiltered by the earth.[107]

Construction methods for floating buildings are unconventional, and have an effect on the scale of the architecture. It is possible to fabricate houses on land and launch them. Their size is limited by the maximum dimensions of the streets and overpasses between the place of assembly and the water. Larger buildings, such as the Bezoekercentrum, are more easily constructed in the water. The quay becomes the building's scaffold. Instead of materials and scaffolding being carted around the building, the building is constantly rotated around the quay, so that the side under construction faces the dock. The building is brought to the material, as its mass becomes inconsequential, registering only in the decreasing freeboard of the floating platform. The total IJburg visitor's complex weighs seven-hundred tonnes, but can be moved, if necessary, with one hand.

Figure 83
IJburg floating neighbourhood, Amsterdam

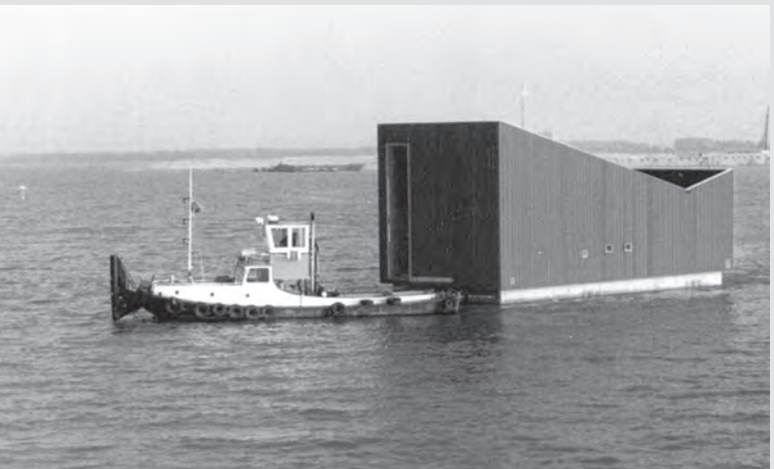
The construction process of building on the water becomes more sensitive to the weather than usual. The foundation moves with its liquid substrate. Construction schedules are dependant on the height of the waves: certain tasks can only be done on certain days. The final step of trimming the building, for instance, must be done on a day of perfectly calm, flat water.

The larger the platforms are, the more stable they become on the water. At the IJburg Bezoekercentrum, the light wood construction is fixed atop three foam-filled concrete foundations. The three parts are fastened together with pre-tensioned cables, creating a complex 700 square meters in area. With this technique, it is possible to make platforms indefinitely large.[108] Floating foundations can grow or be divided in pace with need.

Floating buildings become dynamic elements within the city.[109] During construction of the IJburg site, the visitor centre was periodically moved and moored at interesting places in the development, at the same time keeping it out of the path of the construction. Since 2009, the IJburg Bezoekercentrum was sold, and began its second life as an event centre. It was floated away from IJburg, and is now moored 10km away from its original site, on the north shore of the IJ River.

This sustainable interest in mobility and multi-use also has a political aspect. Although IJburg is generally accepted today, there was controversy when the project began.[110] A floating building gave the City of Amsterdam the opportunity to create a novel, whimsical centre to promote the development to the public, with the possibility of easily removing it

Figure 84
Construction and transportation of floating buildings



after it had served its functional and propagandistic role. The building's transience supported its task. On the other hand, neighbourhoods can be constructed as needed: "you basically create undeveloped land exactly where you need to build most," in the words of Marion Sprenkeler, a spokeswoman for ABC Arkenbouw who have developed floating homes in Amsterdam and Utrecht.[111]

This 'undeveloped land' is both durable and portable. Because floating concrete-and-foam-core foundations are built robustly, they may still be a useable resource after their light superstructures disintegrate. Concrete ships built in the First and Second World Wars, similarly constructed to the floating foundations under the Bezoekercentrum, remain in excellent condition today as breakwaters, and are expected to last a century.[112] The foundations of the IJburg Bezoekercentrum will probably be in service for at least that long, posing interesting possibilities for the buildings that will occupy them in the future.[113] More than mobile buildings, these constructions produce mobile foundations, capable of being conveyed via navigable waters and reconstructed upon.

The relative independence and mobility of buildings on the water is seen by some researchers as a re-ordering of social structure. In contrast to the top-down, heavy, government-controlled projects of the past, such as sea barrier construction and polder-making, floating buildings are seen as small-scaled, grass-root initiatives. Effects are achievable by small groups, contributing to a more socialist, citizen-controlled city. At the same time, floating buildings raise questions about political borders, such as the ownership of

Figure 85
IJburg visitors' centre

waterways, as national water becomes local water when it becomes an inhabited site.

Most immediately, these buildings demonstrate a continued relationship with their land. Floating neighbourhoods allow nature, in the form of water, to flow through highly urbanized places. Appropriately in Holland, the water provides a sense of place, conveying the fierceness or delight of the natural world, accenting this significant element.

The promise and contemporary appeal of floating proposals continues to prove the potential for foundation-building to precisely reflect culture's preoccupations: in this case, a sensation of transience and portability; an interest in personal agency; and a desire for nature in the midst of urbanity. Re-imagined foundations propel a re-imagined city.

Inhabitants of the Netherlands have laboured persistently at the elevation where earth, water, and architecture meet. Their inheritance is maintenance and toil, but they have responded with imagination, continually investing their substructures with cultural value. In the face of rising water or sinking land, people of the Netherlands augmented their capabilities as well as their conception of what a foundation could be. The variety of foundations in the Netherlands attest to more than mere engineering ingenuity, but also to a spirit of creativity and poetic engagement with land, history, and collective architectural ambition. The foundation is a site of cultural identity.

Often our feet are more sensitive to a site than our eyes. In the rise approaching the old

Figure 86
IJburg floating neighbourhood

downtown core of a *terp*-based city, in the uneven floor of a palace, in the thick sandpack of a new housing development, or in the subtle slosh of a floating nightclub, we register the geology beneath us, conveyed through foundations.

Foundations transgress and reveal place. They allow church vaults upon peat-bogs, while inextricably settling concert halls and palaces into the narratives of their sites, despite belied imitation or allusion to the monuments of foreign cultures. Substructures are modulated by the earth and remind us kinaesthetically of where we stand.

Inventive thinking about foundations yields inventive thinking about the land. Imported tufa foundations of Ancient Roman settlers on limited high sand sites, imply a different outlook on the land than the peat cuttings of early Frisians and the timber piles of Medieval Dutch in the marshier parts of the delta. Modern trends towards water-dwelling likewise indicate a substantially new ethos in relation to Dutch waterland.

Foundations are natural time capsules. Church foundations record the efforts of generations, noting moments of provincial ingenuity and Renaissance hubris as faithfully as any parish register. *Terpen* mounds capture thousands of fragments within their millennia-deep blanket-folds of peat.

Generations control the location of the foundation more deliberately than other remains from their time. Unlike discoveries of coins, pottery, or tools, foundations are reliably found where they were placed. Architects' intensions are communicated *in-situ*, enhancing the comprehension of the work. Each foundation is a Pompeian artifact, revealing everyday life

Figure 87
Refounding in Amsterdam.

as it was—aged but not dislocated.

Dutch foundation-building traditions avoid digging and excavation. Rather, piles penetrate to unknown reaches, or layers of peat are added upon older layers. Builders worked with rugged materials, but much of the work was unseen, and the ground rarely exposed. From this heritage arises a custom, practical and symbolic, to leave to the imagination what is buried in the soil of the Netherlands. Maarten Groenendijk, initiator of the archeo-friendly building process in Gouda, explains that there is an intangible value to leaving remains in the soil of the city: "Otherwise the city is hollow, like the *hunnebedden* [megalith burial chambers in the north and east of the Netherlands], where all the artefacts have been taken away and put in a museum. People want to feel that there is still history beneath the city; that it hasn't all been taken away."[114] Statements such as this show how both the actual and the imbued substance of foundations matter.

Figure 88

Kesp and wooden piles during renovation. An esitmated 25 million wooden piles are still in service in the Netherlands. This vast historical archive of wood species, craftmen's marks and tree rings tells of trade routes, advances in construction, and environmental change. Cf. Klaassen 124.

Demanding constant effort and attention, the foundation develops into a focal point of cultural preoccupation. Dutch foundations have historically been a matter of strict responsibility and a locus for subtle fear. A history of cautious legislation surrounds the laying of foundations since the 1400s in Amsterdam. In Delft, as late as 1843, the City Council voted to demolish their tilting church tower, fearing damage to the roof of the nave, until local contractors were able to persuade them otherwise. Despite all calculations and ingenuity, the foundation remained a site of mystery up until the Second World War, with

indefinite rules guiding the construction of projects such as the Concertgebouw and the Beurs van Berlage.

Apprehension has diminished, but the foundation remains a site of invested emotional energy. A sense of precariousness, for instance, is detected in a children's rhyme:

Amsterdam die mooie stad	Amsterdam, that lovely city
is gebouwd op palen.	Is built on wooden piles.
Als die stad eens ommeviel	If that city were to fall
wie zou dat betalen?	Who should pay for it all?[115]

Conversely, the stability of a *terp* foundation is celebrated in a Frisian folk song:

Och, dy bernejierren fleagen	Ah, childhood flew by
Lichter as it swurk foarby,	Lighter than the heavens
Mar dyn griene, leaves blomkes	But your sweet awakening flowers
Binne alle maitiids nij;	Are new again every spring
En in oare, nije jeugd	And in time, other youth
Hat op dy wer wille en freugd';	Will play happily upon you.
Aulde Terp, wat giet foarby,	Old Terp, what does not pass on?
Do, do bliuwst ús altyd by!	But you always remain.[116]

Figure 89
Leaning tower of the Oude Kerk, Delft

While the first poem captures an impression of danger, the second communicates comfort. In both lyrics, the foundation elicits an emotional response. The foundation captivates, as visions of the past and future are projected upon its substance.

The reworked foundation is a site of cultural imagination. Each new generation inherited the responsibility of foundation-building, and each invented techniques which changed the forms of cities. End-bearing timbers allowed unlikely fishing villages at river confluences to grow into wealthy trading ports. Stilt houses over swampy areas permitted islanders on Marken to accommodate a growing population on their finite island home. Today, water-based building promises further changes to the structure and aesthetic of places, performing as dynamic elements in cities generated by citizens instead of government. Buoyant architecture draws the delights of nature into the urban realm. New foundations allow the city to be re-envisioned once again.

To comprehend construction at sea level in the Netherlands is to appreciate much of that culture: its history and place in the world. Building foundations are imaginative artifacts because they are both the means, and products, of architectural desires.

Figure 90
Window, Koningshof Development

1 Vermij 104.
2 Suzuki 344.
3 Child 122-125.
4 Baron 260.
5 Curtin 262.
6 Tordoir 108.
7 Curtin 263.
8 Alter 24.
9 van der Kraan 279.
10 Curtin 263.
11 "1675."
12 "Wat."
13 Hoeksma Figure 2.2.
14 Het Gemeentebestuur.
15 "Westergo."
16 *Ibid.*
17 *Ibid.*
18 Hooksma 28.
19 Het Gemeentebestuur.
20 Hooksma 30. Excavators dug not only as widely as possible, but also deeply. Stagnant water *terp* sites which had been intensively excavated sometimes bred mosquitoes and spread malaria. Cf. Het Gemeentebestuur.
21 Ward-Perkins 68.

Figure 91
Student residence, Delft

22 Vitruvius *De architectura*. 1.4.11.
23 de Jonge 226.
24 Parleviet.
25 Pliny the Elder *Natural History* 16.1.2-5.
26 Janse (2010) 34, "De Oude Kerk."
27 Janse (2004).
28 Janse (2010) 34.
29 Bot.
30 Janse (2004).
31 Janse (2010) 34.
32 *Ibid.* 42.
33 Janse (2004).
34 Janse (1969).
35 Janse (2010) 37.
36 *Ibid.* 35.
37 *Ibid.* 35.
38 *Ibid.* 35.
39 142mm, as an *Amsterdamse* foot is 283 mm. Janse (2010) 36.
40 Tordoir 108.
41 "Koninklijk."
42 Janse (2010) 36.
43 Mak 207.
44 *Ibid.* 37.

45 "History."
46 Beranek 425. The other two are Boston's Symphony Hall and the Musikverein in Vienna.
47 *Ibid*.
48 "Concertgebouw."
49 *Jaarrekening.*
50 van der Plas 42-49.
51 Böhm.
52 "History."
53 van der Plas 44.
54 *Ibid.* 44.
55 "Concertgebouw."
56 Montgomery.
57 van der Plas 44.
58 "History."
59 *Ibid.*
60 *Verklarende.*
61 Janse (2010) 5.
62 The *Normaal Amsterdamse Peil* (N.A.P.) is the legacy of *burgemeester* Johannes Hudde's *stadspeyl*.
63 van der Plas 44.
64 *Ibid.* 45.
65 *Ibid.*

66 *Ibid.* 42.
67 *Ibid.* 43.
68 *Ibid.* 45.
69 *Ibid.* 46.
70 *Ibid*. 45.
71 *Ibid.*
72 *Ibid.* 46.
73 *Ibid.* 47.
74 *Ibid.* 48.
75 *Ibid.*
76 "Beurs van Berlage."
77 Klaassen 125.
78 "Beurs van Berlage."
79 Kooren 2.
80 "Digging deeper."
81 In fact, the Nesciobridge is the Netherland's first suspension bridge. Foster 1.
82 Paul.
83 Foster 6.
84 de Jonge 217.
85 de Jonge 227; Brongers 10.
86 Halbertsma 124.
87 Council of Europe 4.iii, 5.vii.
88 Huisman 8-30.

89 Groenendijk (2012).
90 Vermeer; Nabielek.
91 Groenendijk (2009) 9.
92 *Ibid.* 15
93 Groenendijk (2012).
94 *Ibid.*
95 “Het Edams.”
96 “Living.”
97 McDonald 109.
98 Rosenberg; de Boo.
99 “Fish migration.” Cf. Tokashiki 2
100 van der Veeren 6.
101 *Ibid.* 11.
102 Deltacommissie 9.
103 Rozendaal.
104 *Room*.
105 Levy.
106 “Infocentrum IJburg.”
107 “Working on Water.”
108 “Infocentrum.”
109 Perhaps the most technically difficult component of a floating building is the ‘umbilical cord’ of septic, electricity, and communications that tethers the buildings to the shore.
110 van den Broek.
111 Levy.
112 “Betonnen schepen.”
113 Rozendaal.
114 Groenendijk (2012).
115 “Amsterdam die mooie stad.”
116 “De Terp.”

Kashechewan

Latitude and Perception

The traditional territories of the Omushkego Cree lie within North America's largest wetland. To their south is the fertile Clay Belt of Northern Ontario; a thousand kilometres to the north-west begins an immense country of tundra.

The Lowlands are surrounded by the Precambrian Laurentian Plateau, or 'Canadian Shield', but bear little resemblance to that terrain of shaped bedrock. Instead, the fluvial plains of western James Bay are filled with gravel beaches, bogs, and peat; sedge, mosses, and lichens; paper birch, stunted black spruce, tamarack and willow. This subarctic land of wide and slow-moving rivers is home to moose, caribou, black bear, wolf, and hare, while the coast offers resting grounds for migrating geese.

For almost a thousand years, the Omushkego Cree moved through this landscape in a seasonal cycle, harvesting fish, fowl, berries and game. Their stories, architecture, technology and customs testify to a rich and sophisticated culture, well-adapted to their unique conditions.

Their way of life began to change, however, with the arrival of Europeans for the fur trade, beginning in the 1670s. Subsequent Euro-Canadian contact in the form of missionaries, traders, government officials, white trappers, scientists, and tourists deeply impacted Cree culture, from its value systems to technologies to lifestyles.

Figure 92
Returning from the hunt

We in the south are familiar with this narrative, and use the convenient term ‘traditional territories’ to define the cultural and geographical space occupied by the Omushkego Cree. However, in misinterpreting the term ‘traditional,’ we risk casting the land as a predictable museum piece, and may fail to recognize the deep, nuanced, and ongoing history of the place.

Due in part to their remote and complex environment, the James Bay Lowlands have continued to be a site of negotiation between European and Aboriginal worldviews for over four hundred years.[1] In many parts of the world, any cultural deliberations that have taken place between an indigenous population and newcomers over the meaning or value of a territory have been concluded within a few generations or less. The duration of the discussion in James Bay begins to indicate the creativity at work as Cree have sustained rich and unexpected connections with their land in the face of “centuries of potentially disruptive contact with newcomers.”[2]

We must remember that for the Cree, this is a territory not only of tradition, but also of Wîsakêcâhk, the Trickster-hero of Cree narratives. Even if we do not have the cultural background to interpret Cree stories justly, the ubiquitous, always-changing and never-ending hero clearly challenges static perceptions of the world. The Trickster is in perpetual motion, taking unexpected roles,[3] finding unexpected solutions,[4] inverting norms[5] and critiquing social practises.[6] In Cree culture, the bounds of reality extend from the conscious state to the

dream state.[7] What dreams do, the Trickster does, as he ambles through the story of the bush and plays against the stability of tradition.

The complex story of building foundations in the James Bay Lowlands provides insight into this territory of tradition and Trickster.

The transformation from nomadic life in the bush to static communities on reservations represents one of the most radical and tangible changes to Cree society throughout the course of this cultural exchange. Sometimes the two paradigms of traditional migrating bands and contemporary First Nation reserve communities are presented as a static binary.[8] Consciously or not, today's settled First Nation communities are frequently interpreted as a symbol of a culture's apparent break from past tradition, or even demise.

The nuanced intervening history, however, reveals the continuity of an ancient narrative. The foundation is a site of negotiation, both environmental and social, and in this role it reveals the imagination and adaptability at work for centuries as Cree refigured their ways of life in the advent of new technologies, new pressures and newcomers. Simultaneously, the foundation is a reference for what is persistent, and non-negotiable, to the essential core of Cree hope in their lands.

By following the trajectory of the foundation in Cree culture from before European contact, we are able to reconstruct a narrative that does not centre around European impact on Aboriginal culture, but that begins with a Cree narrative, and then writes newcomers into it.[9]

Figure 93
Albany River, early autumn

Several aspects make the foundation a valuable site through which to consider a new narrative. In the first place, its ordinariness offers an accessible starting point for outsiders to access a rich but unfamiliar epistemology. A premise of this text is that through the mundane details of preparing ground to build, cultures disclose attitudes and worldviews as diverse as the solutions they invent. The way the Cree construct in their physical, human environment is directly related to their cultural understanding about what is non-physical or non-human.

Relatedly, the foundation is an index in the relationship of the Cree and their land. This is especially significant where the land has always been vital as a basis for identity, spirituality, sustenance, customs and rights.[10]

Loaded with explicit and implicit cultural significance, the foundation is exceptional for its ability to guide us through a complex and sensitive social history. The pattern of Cree foundation-building has influenced and been influenced by newcomers to the Lowlands, from fur traders to missionaries to white trappers to school teachers to scientists and tourists. A story of the foundation narrates us through a history of relationships on the Bay.

As a profoundly altered technology, the foundation provides a test to the maxim that 'tradition is not technology-dependent', proposed by native thinkers. The radically recast technology of the foundation allows us to consider What is traditional? What traditions remain from Cree architectural heritage, and what inheritances can be brought forward?

It is a timely moment to consider foundations for the community of Kashechewan, around which the final portion of this text revolves. The community is adjacent to one of the Hudson's Bay Company oldest trading posts, Fort Albany—a part of the founding myth of Canada.

Flooding and overcrowding, however, have prompted the community to consider relocating, and the First Nation's hope in the land's ability to provide has been challenged. Their current situation requires consideration of how new foundations can continue their inheritance. The extraordinary adaptability of the Cree suggests that the way that they choose to build and to found themselves in the future, is anything but inevitable.

The foundation gives us an opportunity to reconsider the account we have written, and are writing, about the North. Returning to the foundation is one means by which to breach the origin, connect with the past, and begin a story again in a new way, with the open-endedness of a Cree narrative.

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Figure 94
Albany River and Willow Creek, early spring


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Foundation-building begins with pressing a pole into the earth. The soft soil is not a liability, but a help.

This material, varying seasonally in softness, fragrance and colour, provides the name by which the people of this region identify themselves: Omushkegowak, or Swampy Cree. The soil changes with the seasons, as the people do.

During the summer, Cree travelled freely along the major rivers, harvesting fish and berries and camping on relatively firm, dry banks. In the fall, hunters gathered migrating waterfowl on the shores of James Bay, smoking the meat in tipis with floors of spruce boughs to stay dry in the low plains along the coast.

In past times, families would leave the shores of the Bay at the start of cold winters, making the journey inland over the frosted ground to their wintering grounds. Deep drifts helped in hunting—big game like moose and caribou floundered in the drifts[11]—and the snow offered a more consistent terrain than the peat and marshes dormant beneath. Hunters with snowshoes and sleds travelled long trap lines, and often had greatest hunting success in the wintertime. Animal furs were at peak quality during this time of easy travel.[12] When a big kill was made, the whole camp might be relocated to the site: moving the dwelling of an able-bodied family was more practical than moving the hunted animals.

In the spring, trails through the wet muskeg were impassibly soft and made hunting impossible. Cree had to leave their inland sites and reach their canoes stored by the rivers before the ground thawed: neither liquid nor solid, the spring muskeg is impassable to

Figure 95
Willow wigwam pole, Half Kash

foot or paddle. Elders explain that in the past, spring was the hungriest time of the year, and character was shown most plainly. Cree waited patiently on the shores as the ground around them thawed, until the rivers had cleared of ice and they could return to their summer grounds.

The changing ground promoted a pattern of movement, but also of socialization. Summers of dry land and open water were a time for hunting bands to come together for marriages and celebrations. Some years, hunters would travel with neighbouring bands to give their own lands a rest. The reciprocal importance of relationships and movement can still be observed today during 'Goose Break' cultural holiday weeks, as Cree travel together by boat in the fall, and by snow machine in the spring, meeting in the bush.[13] Families who now live in separate communities gather again on the common ground of their traditional lands.

Patterns of movement and relationships are correspondingly essential in the structures that Cree build upon the changing muskeg. A variety of dwelling types provide comfort in diverse environments. In the winter, lodges of heavy logs make a comfortable base camp from which to travel. In wet landscapes of flexible willow, the wigwam is preferred; tipis are built in landscapes of straight spruce and pine.

The tent in particular is significant as a basis for movement. The simplicity of the form and construction make it possible to erect from local materials. But the tent's value as a mobile structure goes beyond the simple convenience of its portability.

Figure 96
Log foundation of an abandoned hunting camp, upriver from Kahwaquanakak

A tent's translucent skin provides continuity despite movement. For a nomadic people, what is outside changes continually while what is inside remains familiar. The screen of the tent wall catches the shadows of the bush on its surface each day. At night, the tent is lit from within and is a waymarker to guide home those who are outside.

The tipi is comfortable. As an outsider, it is interesting how often and eagerly Cree people will happily ask, 'Doesn't it feel good in here?' This question is part of making a relationship: it expresses an involuntary wish to see that someone is sharing the same pleasure. Beyond the physical comfort experienced in the tipi, however, the Cree experience the comfort of a deep familiarity. In listening to Cree elders, one gets an impression that each new tipi erected is in some sense a continuation of previous tents. The space of the tent can be taken down and reassembled. It is possible for an outsider to imagine how a tipi deconstructed in one place and re-erected in another using some of the same materials could represent the same space, but the familiarity is based neither on the reuse of materials nor the constancy of geography: The tipi freshly made in the backyard not only reminds Cree of their youth in the bush, but is, in an essential way, the same space.[14]

The abiding tent is a conceptual space. The tent offers a platform from which to consider and comprehend: the place of the human within the space of the bush. The importance of this thinking is still evident in communities where the 'Walking Out' ceremony is practised. Here Cree children are carried, and do not touch the ground outdoors until the springtime rite. Children dwell in the protected human space of the tent, until they are ready to walk and to

Figure 97
Translucent skin of tent

make their own direct connections to the non-human world. Movement—'walking out'—is directly coincident with the responsibility of relating independently to the outside world. The walking out ceremony is a round trip from the human space of the tent, to the outdoors, and back again.[15]

The threshold between indoors and out is gentle. The thin boundaries of the tent are simultaneously protective and connective. On the one hand, one is sheltered from the bush—however the bush is also present, and even concentrated in the tent in the smell of cedar or spruce boughs on the floor. One is protected from the wind, but aware of its pressures on the folds of the tent. One walks on the surface of the earth, although it is cushioned by boughs underfoot. A trace of snow and rain may enter the building through the same opening that lets the smoke out.

In contemporary tents, it is evident that builders take great effort to balance the lighting in the space, keeping the southern sun from making the tipi too bright or warm, and making sure there is sufficient light to prepare meat. The interior feels both dark and luminous. The sky is filtered but there is enough light to see. Mixed with wood smoke, the space is reminiscent of the creation story, in which the first man and woman wait in a soft mist until they are placed on the earth. It is a space of vague but powerful potential. Nothing is entirely blocked out or cut off, but instead light, wind, earth and rain are gently filtered into the Cree human space of the tent.

The wall of the tent is analogous to the slight boundary that separates the human world

Figure 98
Spruce bough floor of tipi

from the non-human world. These worlds can impress themselves one on another. Cree pass regularly and easily between these worlds—the geographical and spiritual landscapes they inhabit—as easily as they leave or enter their tent. These worlds, like the tent, are not hermetic but highly contingent.

The tent epitomizes ideals of connectedness, as it registers and projects inside on outside and outside on inside. The tent is a place of reciprocity: the Cree have made a structure which is symbolically both a stable dwelling and a responsive shelter, acknowledging and promoting the interconnectedness of self to every living thing.

The moving pattern of camps and tents through the year calls attention to the absence of the fixed monument in Omushkegowak culture. Instead, memory is preserved in a different way. In the past, when an elder wished to say something to young person, he might put a knife in the ground between them, telling the young person, If you do not believe me, you can stab me with this knife. This act acknowledged the freedom of the listener, but it also made evident a vital point. Refusing to listen was equivalent to causing the death of the elder: within the context of an oral tradition, there was no other way for the elder to transmit his knowledge. Only in the story, and through the relationship, could the memory be preserved.[16]

In these ways, movement and relationships are interwoven in the Cree worldview, and manifested in Cree architecture.

Figure 99 (facing)
Smoking goose on racks in tipi

Figure 100 (below)
Roasting goose on stakes

Latitude is a critical dimension of foundation-building in the Lowlands. This is not the measured northern latitude that we associate with high costs and logistical difficulties, but the synthesis of movement and relationship, expressed in the unmeasurable openness of a hunt. A successful hunter makes relationships in the bush, both with human-beings and animal-beings. The willingness to be mobile—even moving between worlds—is a part of that relationship. For the Cree, the foundation recalls the ability to locate oneself within a territory that is not fixed. New influences or potentials are not rejected out of hand, but are gently filtered. Relationships require movement—a willingness to embark—and for the Cree this may not only be physical but also mental, emotional or spiritual.

'Perception' is the inheritance of Latitude. For the Omushkego Cree, the undelineated, open space of their traditional lands connects them to their ancestors. The experience of the land persists. They approach a site and environment as their forbearers did, perceiving the same ephemera from a similar initial freshness of contact. They share a connection to their ancestors through a shared reaction to the environment, which has not been fixed or indelibly marked, but is still open-ended, with a vague and unknown potential. Choice has been preserved: nomadic groups have the freedom to act based on this nuanced perception of the environment available to them. There is both the potential and willingness to make relationships and to embark into non-fixed territory.

Fur traders were among the first to step into this Cree world. Almost immediately, the

foundation became a point of negotiation not only with the environment, but also with newcomers—or more precisely, as newcomers became a part of the environment, they also became a part of the negotiation. The nomadic lifestyle and the manner of foundation-building became points of exchange in the narrative. [17]

The earliest European traders relied heavily on the generosity of their Cree neighbours. Unlike their superiors in England, who benefitted only from the movement of furs, traders were bound more closely to the muskeg. They required a balance of both furs and meat for food, as did the indigenous bands that surrounded them.

Unlike the Cree, however, European traders dwelt more tentatively on the land. For centuries, they rarely ventured inland from the coast. Often Europeans were more nomadic than the Cree: for decades after the destruction of Fort Charles by the French in 1693 on the Eastmain in Quebec, the few traders in the area chose to live seasonally aboard ships.[18]

When traders wished to establish a Fort, it required careful negotiation. These posts were an intrusion on the existing landscape, but they were not wholly a European intervention. From the beginning, Cree were involved in defining the physical and symbolic territory of these posts: location, identity, sustainability, and meaning.[19] The sites on which the Forts were founded were determined through the synthesis of local Cree knowledge (strategic confluence of waterways, shelter from the cold, and dry land) and trader priorities (access for burdensome ships and military security).[20] The advice of elders was critical to the long-term success of the trading posts.

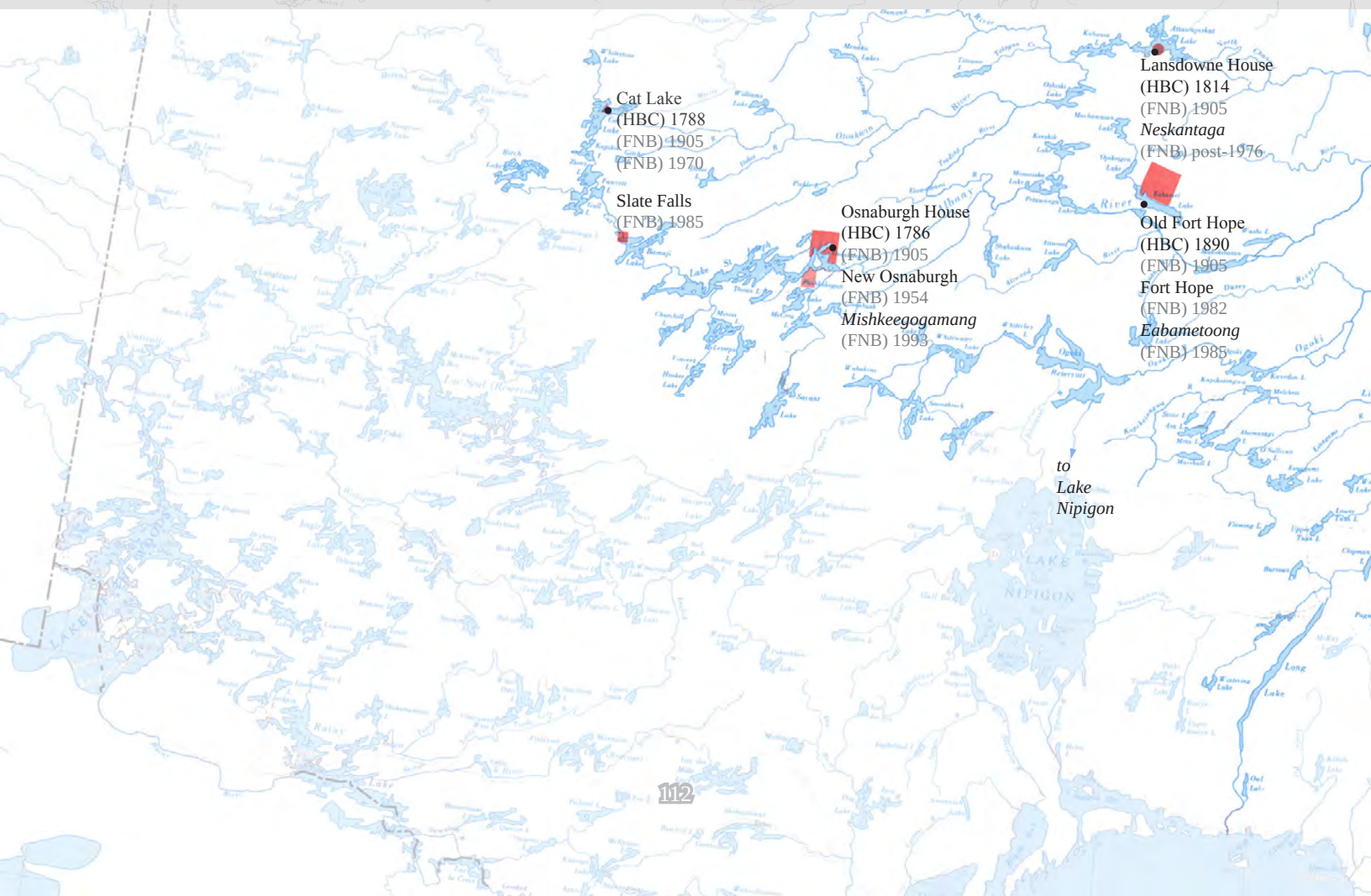
Figure 101

Tipi and peaked roofs visible over the crest of the bank, Fort Albany

The Hudson's Bay Company established three original posts on James Bay in the late 1660s, including Fort Albany in the west, Moose Fort in the south (now Moose Factory), and Fort Charles in the east (formerly Rupert House, now Waskaganish). These settled posts with their curiously fixed foundations, and others that followed them, became new points of reference within the world of the hunt.

Some natives attached themselves to particular forts, choosing to stay near the coast through the winter, hunt waterfowl in the spring and fall, and sometimes labour for the Company in the summer. These individuals were noted in company records as 'Homeguard Indians'.[21] While there may have been Cree groups who occupied parts of the James Bay coast throughout the year,[22] the Homeguard Indians were among the first to alter their well-established nomadic cycle, adapting to fill a need and benefitting from a way of life that was in some ways easier than full-time life in the bush.[23]

Although many Cree changed their patterns in the face of European influence, they also affected Europeans settlements, and imbued the places with their own customs and significance. The historical record shows how the Cree brought traders into the system of Cree hunting, making the traders collect furs from outside of the post to involve them in the hunt.[24] Celebrations like marriages mixed cultural traditions, and Christmas celebrations might be "interrupted now and again by some old hunter singing his praises to the Bear or the Lynx."[25] Notionally, the Hudson's Bay Company had legal authority in Rupert's Land, but 'factors' (bosses) allowed Cree jurisprudence to govern in many instances.[26] The canoe,



toboggan, and snowshoe were invaluable indigenous inventions for the fur trade,[27] and travelling Cree provided vital communication and transportation systems between forts.[28] Homeguard Indians were not dependent on the posts, as has been suggested in the past,[29] nearly so much as the posts were dependent on their Homeguard Indians.

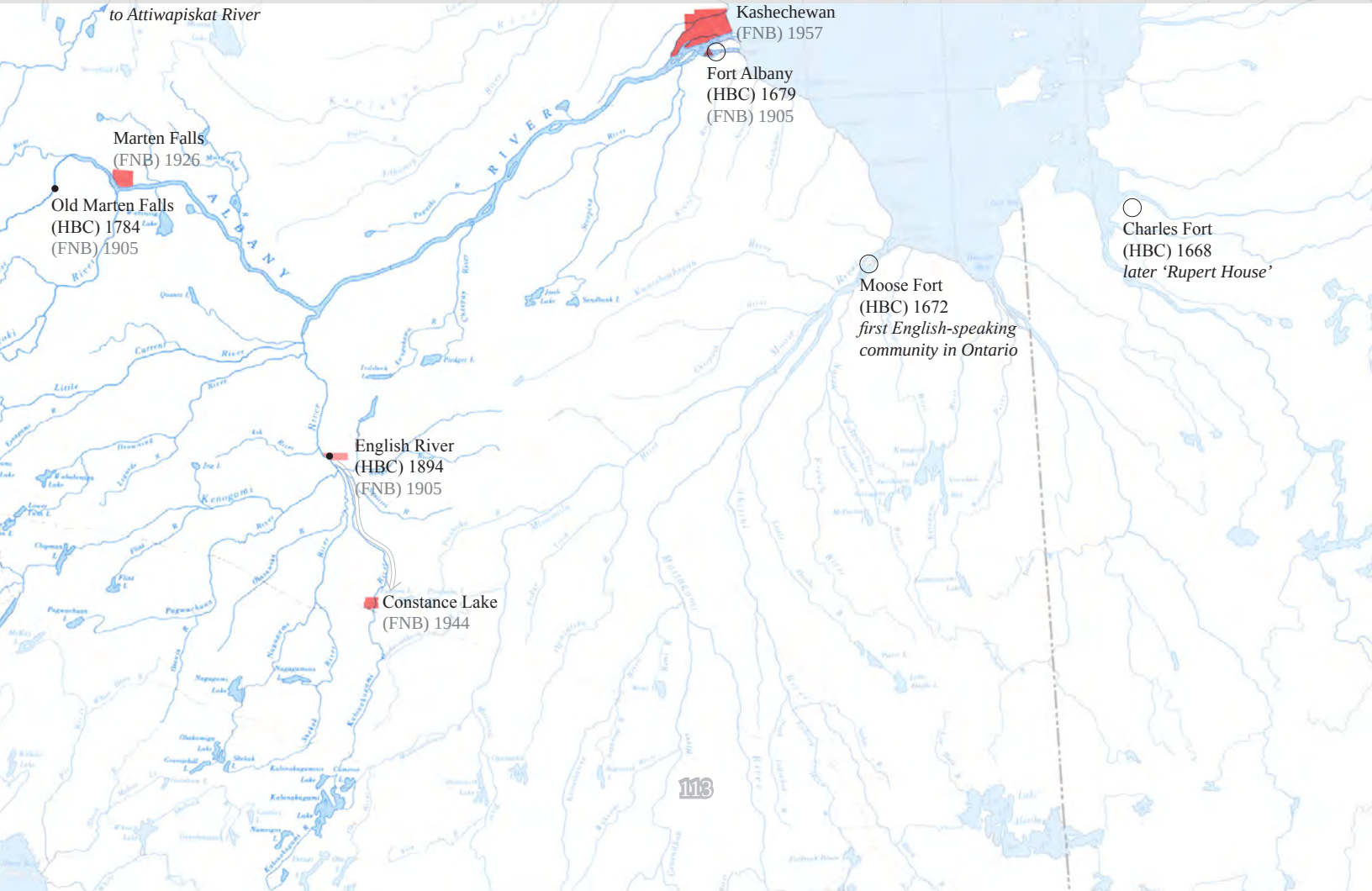
Likewise, the architecture of the forts was not a wholly, or even mainly, based on European types:[30] in built form, many posts, especially minor ones, resembled Indian villages more than European settlements.[31] The most significant differences was that the posts did not move over the landscape. Despite their foundation, Cree exerted marked influence on these fixed settlements, foreign as they were to native nomadic ways.

When missionaries entered the Lowlands, the nomadic lifestyle of the Cree again played a part in how this foreign influence was felt. Missionary presence remained relatively minor in comparison with the population of Crees and traders, especially at a time when the Church was more interested in directing funds towards Asia. Isolated and realistic, many missionaries realized that in order to spread their message to a nomadic people they needed the assistance of men who could carry that message into the bush.

Missionaries found allies in the 'countrymen', children of mixed parentage who knew the languages and customs of their Cree and European backgrounds. These men knew the land and could provide for themselves as they travelled for the ministry, relieving the mission from supporting them financially.

Figure 102

Early fur-trading posts (HBC) on the Albany River and subsequent refoundations as First Nation Band communities (FNB: present-day reserve lands related to these posts shown in red). The mouth of the Albany River was a strategic location, with direct connections via waterway to Lake Superior, Lake Nipigon, and Attiwapitskat River. Furs from as far west as Cat Lake were traded at Fort Albany.



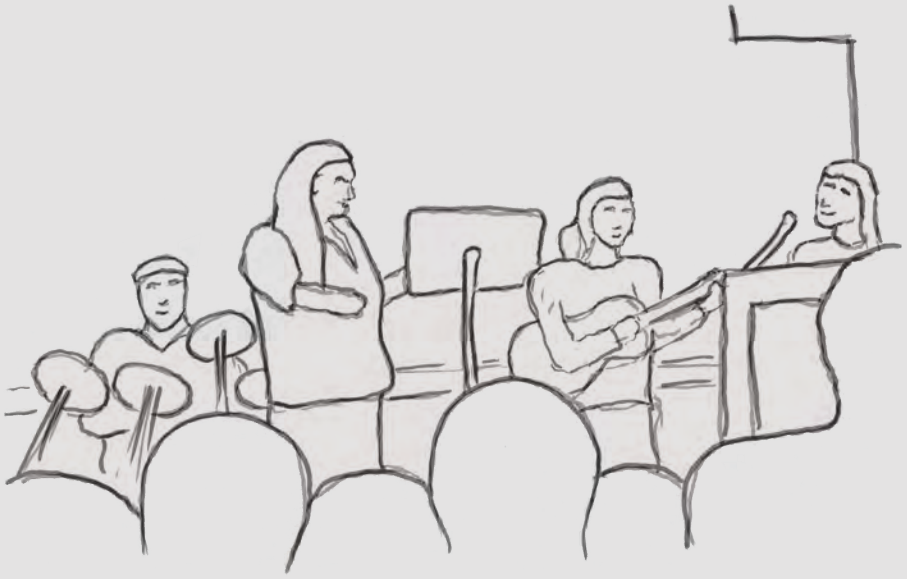
The trade-off, however, was that the missionaries gave up significant control over the message that was preached. The countrymen, as messengers and translators, brought their own interpretations to the gospel message, informed by their double heritage.[32] Consequently, the nomadic lifestyle of the population had a direct effect on the Christian message that was preached in James Bay, that Cree heard and responded to.

While the Cree drew out their own understanding of Christianity, missionaries had difficulty reconciling the possibility that nomads could be true converts. Churchmen earnestly, albeit mistakenly, promoted agriculture. After visiting Moosonee, David Lofthouse, the first bishop of Rupert's Land, commented that "I am convinced that the work will be more permanent, and the gospel take deeper root, when the people are settled with something to bind and connect them with the soil."[33] His statement indicates a lack of comprehension of the ways of people whose very identity was already complexly bound to the soil.

There were thus ideological conflicts with missionaries over the understanding of foundation, to a degree that had not been experienced with fur traders. While the fur trade appreciated aspects of the Cree's changing lifestyle, some in the church felt that settlement was essential, and not simply a mundane point.[34]

Despite these tensions, many Cree parsed an essential message from Euro-Canadian presuppositions, as they continue to do today.[35] The longevity of the Christian message among the Cree, from times when missionaries were scarce until the present, even after a

Figure 103
Full stage at Faith Temple



shameful history of residential schools, indicates that there is more to their conversion than an imposed set of religious beliefs. Christianity became important to the Cree because they filtered it into their own worldview, and, perhaps because it was communicated through their own middlemen, its powerful messages resonated with their own.

As with Christianity, so with syllabics. The writing systems generated by missionaries are sometimes regarded in popular understanding as a subjugation of an oral people. This concern, however, is belied both by the dearth of missionaries, and the rapid rise of syllabic use within a short relatively timeframe.[36] James Evans, working among the Ojibwa of Rice Lake throughout the 1820s and '30s, formalized a syllabic system in 1836, and adapted them for the Cree language in autumn of 1840 when he was appointed to Norway House north of Lake Winnipeg.[37] By the time fellow Methodist minister George Barnley travelled to Moose Factory in November of 1841, he met Cree there who wrote in syllabics even though they had never before met a missionary.[38] Writing was not imposed from without but propelled from within as natives taught each other and integrated the new technology into their world.[39]

On the one hand, this situation demonstrates how knowledge was disseminated quickly through a mobile society. Conversely, from their introduction, we may observe how syllabics exerted influence on nomadic life. Cree congregated around missionaries during the summer, and wished for their children to learn to learn to write in Cree.[40] Increasingly, trading/mission posts became a part of the geography not only of Cree hunters or Cree women married to Euro-Canadian traders, but of all of Cree society. Eventually, the creation of schools

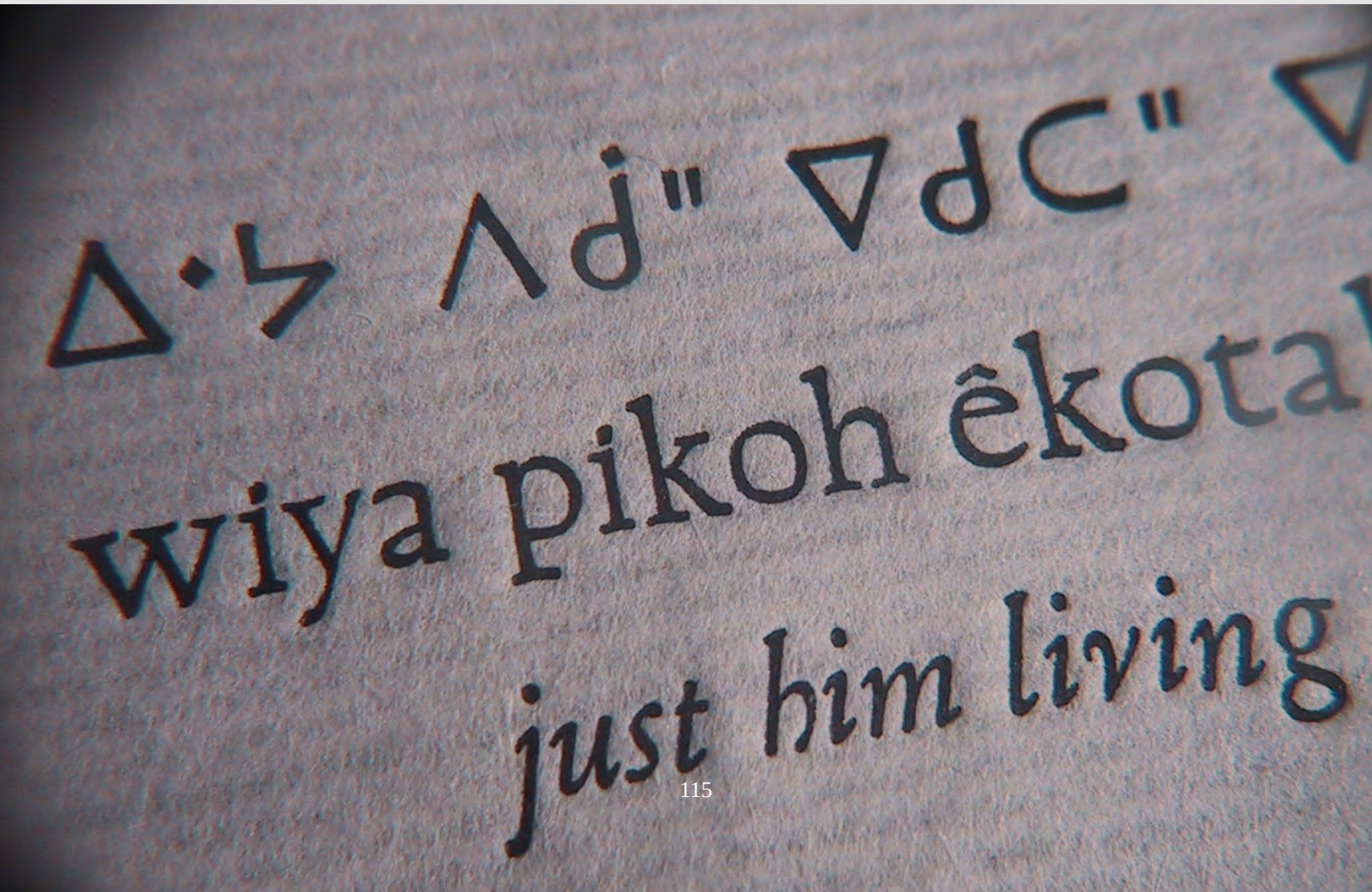


Figure 104
Cree syllabics

would profoundly influence the settling of villages, but in the period before schools became compulsory (and thus non-negotiable), there was a syncretic process at work which brought slight but significant changes to the nomadic cycle.

As the posts grew and changed in character, Cree continued to imbue them with a Cree narrative and meaning. Cree sometimes brought their elderly to the posts to be looked after at their deaths. Traders recognized that these elders were physically comfortable and well-cared for at these settled places.[41] Missionaries, unsurprisingly, interpreted a religious significance to these actions—that the Cree wished to be buried in Christian burial plots.

At times either interpretation may have been correct, but traders and missionaries may not have been aware of another cultural reason for the move. When a person died in the bush, that area was to be left untraveled and unhunted for a time. The land lay 'fallow'. By bringing the elderly to the posts, the Cree were relieved of this duty, which became especially burdensome during times of scarcity.[42] The Cree used fixed points within the open landscape to their own advantage, expanding the significance of trading posts within the context of their own culture.

Each of these three parties of early contact history—traders, missionaries, and Cree—brought their own interests into the negotiation surrounding foundations. Fur traders sought help in establishing their own posts in the muskeg, but generally wished for the natives to continue hunting on the land. Missionaries desired for the Cree, and especially the children, to stay nearby to learn writing, agriculture, and a sedentary lifestyle,[43] but were beholden both

Figure 105
Uncovered tipi structure between two rectangular sheds.

to the requirements of the fur trade and to the participation of the Cree. The Cree filtered new ideas into their own cultural framework, and found meaning in all the environments of the hunt: old and new, open and fixed.

In 1905, representatives from the Federal Government canoed along the waterways of the James Bay watershed, signing Cree bands on to Treaty Number 9. The representatives' visits were short—at Fort Albany for instance, they gave one day notice of their coming, stayed one day in the community, and gave one hour for the community to think over their offer—but the effects were lasting.[44]

The wording of the document had been determined by the Federal Government and the Government of Ontario, and there was no further possibility of negotiation. The text described that in exchange for money, education, and a reserve, Cree would surrender "for ever, all their rights titles and priveges whatsoever [*sic*]" to their lands, with the provision that they might "pursue their usual vocations of hunting, trapping and fishing throughout the tract surrendered…subject to such regulations as may from time to time be made by the government of the country….and saving and excepting such tracts as may be required or taken up from time to time for settlement, mining, lumbering, trading, or other purposes."

The phrasing sought to extinguish native title to their lands, giving ultimate and total control over the land to the government. To make these terms palatable to the Cree, representatives allegedly misled[45] the bands and offered oral and implied commitments which

Figure 106
View of James Bay Lowland river delta from the air.

have been the subject of contention ever since.

The effect of Treaty No. 9 reverberated through to the foundation. The treaty prescribed use and drew inflexible[46] boundaries on this formerly open landscape. These abstract perimeters were tools through which the government could, and did, propel nomadic families to the villages.

The Treaty also had the curious effect of inverting the historical situation. Typically, Cree had established villages at the sites of former trading posts, and this is where they were often granted reserves.[47] Consequently, while the posts had originally been Euro-Canadian intrusions into the bush, they now became fixed[48] sites where Cree could exercise greatest control. Simultaneously, the vast territory of their bush homeland, formerly protected in its remoteness, was now open to exploitation.

The Treaty provision of education was likely one appealing factor to the Cree in these negotiations. Rights to education were,[49] and are,[50] valued by the Cree.

There have been moments of meaningful cultural exchange through teaching in western James Bay, as elsewhere in Canada. These moments seem to have occurred most readily where learning was mutual. However, with the creation of the Indian Act in 1876 and the institution of compulsory education in 1884, an already existing system of residential schools[51] gained terrible potential. By 1931, the residential school system had reached its peak.[52] Native children were jarred into a frightening reality, taken from their families and

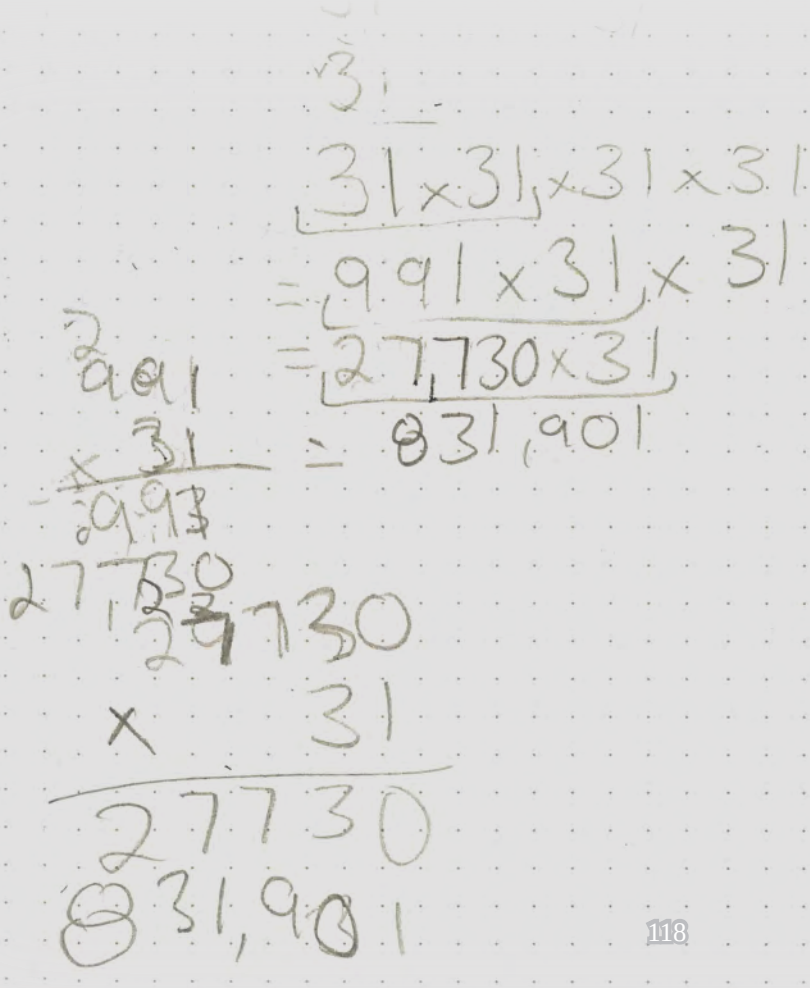


Figure 107
Showing off her math skills, a twelve year-old Cree girl spontaneously attempts to solve the fourth power of thirty-one in my notebook.

way of life, deprived of their ancestral languages, and exposed to physical, emotional, and sexual abuse.

This painful and shameful history, completely absent of any hint of negotiation, lies so far outside of the continuous thread of Cree narrative which we seek to follow here. Its mention must simply interrupt this text in acknowledgement of the drastic way in which the lives of Cree were so disrupted, with effects on settlement, and sense of place which cannot be fully recounted.

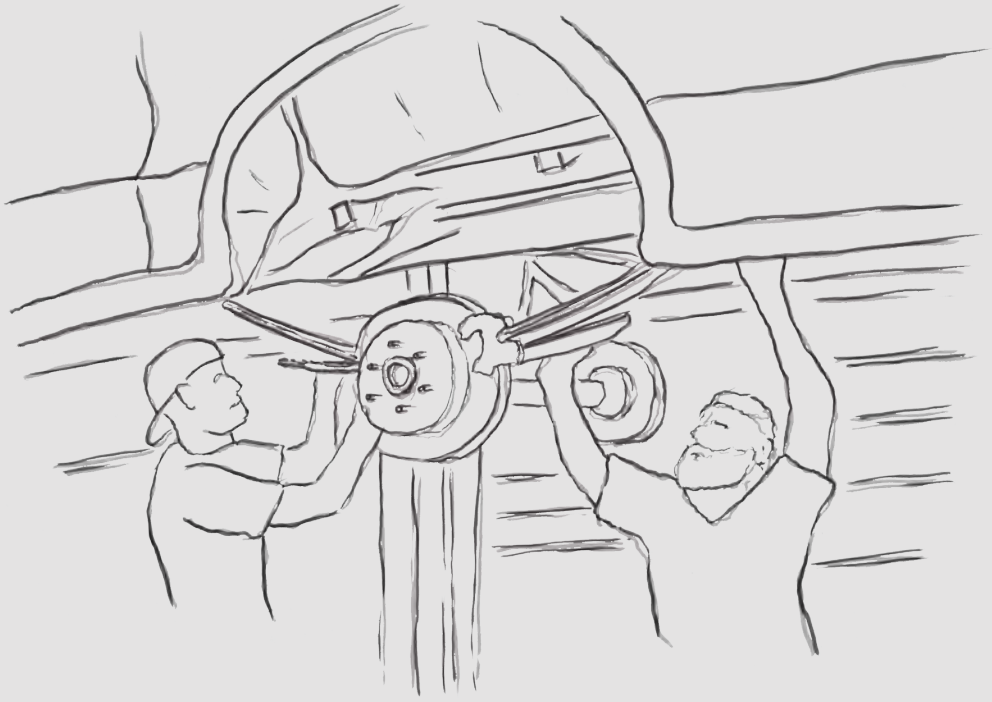
It is fortunately easier to discern the persistence of a narrative in the influence of the Day Schools, without missing or dismissing the injustices which sometimes occurred in these environments as well. Many of the tragedies of the residential schools also occurred at the village schools, and both types of schools were propelled by the same destructive mandate of assimilation. Children went home to their families at night, though, and the strength of these intact social networks gave the Cree power. Their collective response is preserved in the structures of many settled villages.

Cree sought instruction for their children, recognizing that this would be important for future negotiations with white people,[53] but they never endorsed the program of cultural transformation that accompanied the Canadian government's impositions. From the beginning of their use, Native parents considered the residential schools, especially, to be a violation of the treaties.

Overall, native people preferred day schools.[54] Within their history there had been

Figure 108

After-hours in the high school mechanic shop, replacing the rear leaf springs of a truck



meaningful interactions within the context of such schools: the original school in Attiwapiskat, for example, built by missionaries in 1938,[55] only operated in July and August, so that they would not disrupt the seasonal cycle of the hunt. In the words of a Cree elder, "The Priest did not want to interfere with traditional life."[56] This may have been a cultural inevitability as much as a gesture of goodwill, however such examples may be (and are) interpreted as moments of meaningful negotiation within a darker history.[57]

By the late 1800s, and increasingly through the 1900s, there were immense and systematic pressures on parents to send their children to school. Treaty agreements were honoured only when children were enrolled. After the Second World War, the implementation of Bay Bonuses was used coercively;[58] similarly, needy families were not given welfare assistance if it was found that their children were not attending school.[59]

In the face of these pressures, rather than losing their children to residential schools, many families chose to move to areas with Village Schools.[60] These schools, more than many other influences, have been instrumental in the growth of communities such as Attiwapiskat and Winisk (now Peawanuck).

This effect of the schools as attractors had already been observed among early missionary teachers. In those days, parents were often discouraged from camping near the schools, both by the missionaries who wished to separate the children from their cultural influences, and especially by the fur traders who wished for the parents to harvest animals. But in the second half of the 20th century, village schools became inevitable attractors, and villages grew

Figure 109
Children playing road hockey on a spring evening.

continuously around them up until the 1970s.

For the sake of relationships, parents surrendered a thousand year old tradition of migration, and this sacrifice is recorded in the fixed foundations of many coastal communities of James Bay.[61]

On the other side of James Bay and in Northwestern Ontario, commercial interests have threatened and displaced communities. Such intense pressures have been slower to come to western James Bay. Recent commercial pressures now threaten to disturb the settlement pattern of this region.

Increasingly, the muskeg is an area of commercial interest. Consultants for the Ontario Waterpower Association regard hydroelectric projects for the Lower Albany as "practical 'large hydro' projects," despite 'limitations' such as the Northern River Agreement.[62] The James Bay Lowlands are called *shi-ka-shi-mow* in Cree: "the gradually sloping land."[63] This gradual slope is not an advantage for engineers, local populations, or for the environment, requiring wide dams and extensive flood reservoirs for power generation, compared to the landscape of steep bedrock drops typical throughout the Precambrian Shield.[64] Such projects threaten mobility on the water and the safety of eating 'country food' such as fish,[65] which still account for a significant proportion of family's diets.[66] Development on traditional lands has the effect of confining native people to their reserves. As traplines and hunting grounds are taken, Cree rely increasingly on a wage economy and southern imports of food and fuel,

Figure 110
Through rapids past Mishepawetik Island (left)

rather than meeting their needs through bush activities.

Although the James Bay Lowlands are poor in commercial timber, they are rich in minerals. Ontario's Northern Development, Mines and Forestry Minister calls the region "home to one of the most promising mineral development opportunities in Ontario in more than a century," referring to the 5000 square kilometer area of chromite, nickel, copper, and platinum deposits popularly known as the 'Ring of Fire'.[67] The development lies within the Attawapiskat and Albany Watersheds.

It is inconceivable that commercial activities on this scale would not affect the futures—and in some cases, existence—of surrounding James Bay Lowland communities. Native Bands and interest groups record the cumulative disturbances[68] to the few remaining pristine rivers in Ontario,[69] and anticipate potential effects on the hunt and the prosperity of their subsistence-reliant communities.[70] Mining companies, meanwhile, project more drastic visions. Frank Smeenk, president and CEO of KWG Resources, which owns a 30% stake of the so-called 'Big Daddy' deposit,[71] imagines founding a town near the mine to "bring all of these remote First Nation communities into the First World, which they all desperately want. It's not the perfect place to have a town—it's really a bug-infested swamp that's frozen two-thirds of the year—but there's no reason not to have a town up there—with some constraints."[72] Competing visions of community and the worth of the land will play out against the southern demand for stainless steel.

These latest relationships foster situations where the Cree are simultaneously fixed

Figure 111

View towards Kakago Island, upstream of Kashechewan. Hunters and travellers drink directly from the Albany River

and unsettled: increasingly confined to their reserves, while unsure of the future of their communities. The foundations of their communities are unstable points in the negotiation between southern priorities and native rights.

Despite the powerful demands at play, however, we should not regard the results of this negotiation as a foregone conclusion. Intellectually,[73] philosophically,[74] politically and legally, indigenous positions are increasingly understood and validated. The centuries-old negotiation remains open-ended up until the present day.

Today many newcomers to the north deal not in goods and furs, but in stories. Academics and journalists, as well as nurses, teachers, and paramedics return to their homes with narratives for a southern audience. These non-indigenous storytellers also influence foundations through the effects they have on public sentiment and policy.

The storyteller has incredible power. Outsiders who presume to interpret on behalf of the Cree may (inadvertently or intentionally) eclipse the local voice because they are seeing the reserves through a cultural lens. They often take their own background knowledge as a conceptual basis during a relatively short time spent with the native people.[75] Because their experiences may often be so different from their expectations, these storytellers may be unable to reconcile the amalgam of old and new ways. Perceiving only the disjunctions between nomadic settlement and contemporary reserves, they omit the intervening history.

Neglecting the long view is dangerous when it translates into public sentiment and policy.

Figure 112
Fire in tipi at night

Where the modern Cree are depicted as entirely out of touch with their ancestors' ways, this breeds the sort of uncomprehending, paternalistic policies that continue to contribute to instability on remote northern reserves.[76] Conversely, political and social thinkers suggest that integrating complex aboriginal worldviews into our Western understanding is vital in creating a more resilient society.[77]

The negotiation holds promise for the endurance of both cultures, then, as it did in the past. Storytellers that go between the James Bay Lowlands and the South have a responsibility and privilege to witness the changing lifestyles of the Omushkegowak even as they allow for the continuity of tradition. The South is already related to the Lowlands, through history and increasingly through resource use: the storyteller may tell and interpret the full breadth of this relationship as best he or she can.

The foundation was modulated first by millennia of experience in the bush, and then by centuries of interaction with Euro-Canadians. While many technologies were introduced or altered through this cultural exchange, including guns, books, and snow machines, the foundation is arguably the most profoundly altered technology.

Subsequently, the foundation is a valuable test to the proposition of Native thinkers that 'tradition is not technology-dependant.'[78] The radically recast technology of the foundation allows us to consider what is traditional in the Lowlands, by revealing aspects of the Cree relationship to their lands which have been preserved despite new manners of building and

dwelling upon it. In some way, while in the previous sections the foundation provides insight into the creative negotiation and adaptability of the Cree, the foundation as technology now provides insight into what is non-negotiable to them—the traditions that persists even as the technology changes.

Settled villages have brought many changes. Studies report numerous negative effects. Decreased activity in the bush is related to social and physical problems. An inability to move has left populations vulnerable to changing environmental conditions, such as increased springtime flooding. The role of the family has changed and the unity of the family has been challenged: hunting parties are less often composed of family units; hunters instead now work alone or with small groups of other men on shorter excursions supplemented by the power of guns, snow machines, and helicopters.[79] Women have lost some of the symbolic[80] and valued practical importance[81] that they previously had in the hunt.

These new narratives derived in large part from fixed foundations challenge Cree conceptions, but up to the present time they have never erased the core of ancient Cree narratives. Two reciprocal themes persist: generosity on the land, and hope in the land.

Traditional generosity[82] is shown when the bounty of a hunted moose is shared with family and friends, especially those who cannot travel in the bush themselves, allowing everyone to take part in the hunt.[83] More remarkable is Cree openhandedness towards outsiders. In speaking of the James Bay Cree on the east side of the Bay, Carlson notes, “Today, many Cree feel that love and generosity, shown even to those who are doing harm to them and their

Figure 113
Enjoying lunch with family in the bush

land, is part of their relationship with their land: it is important to show not only love *for* the land but also love *on* the land."[84] These words apply equally to the western James Bay Cree, who similarly showed love on the land by sustaining early traders with knowledge and supplies of meat when they would have otherwise starved,[85] and who continue to be proud of their reputation of welcoming visitors.

Cree express generosity not only in what they give, but also in what they are willing to receive. In conversations, ideas are not rejected out of hand. The same process of filtering outside influences into Cree understanding, manifested in the architecture of their tents, continues to guide social interactions.

To spend any time talking to the Cree about their land or about the hunt is to become aware of an infectious excitement. Not only are the Cree generous on the land, but they are humbly expectant that the land will provide for them.

This enthusiasm is present in the village. Driving around in a truck or seated on the spruce bough floor of a tipi, one is struck by the myriad possibilities they see for the future of these lands. But in the bush this excitement is especially keen.

On a trip upriver, two brothers teach me how to set trap lines. As we twist wire they explain and anticipate how the animals will be caught in their snares, creating the moment with their words before it has occurred. Their excitement is partly in the novelty of sharing the experience with a newcomer—"We're going to teach you things you've never seen in the South!"—but it is evident as they talk to each other in Cree that this delight and pre-

Figure 114
Setting a marten trap

enactment is a natural part of the work.

Later, as we return to the traps, the atmosphere is also cheerful, even when the first trap has been robbed of its goose meat: “Oh! See that? He took it! But I bet you he’s in the next one.” As indeed he is. But even when several of the following traps are empty, the brothers express surprise without dismay. Small anecdotes such as these point to an underlying cultural outlook that the land will not disappoint in the long-term.

Hans Carlson, who has spent years among the Eastern James Bay Cree, corroborates this impression with his own understanding. “Hope for the Cree is not a passive emotion related to pessimism or giving up, as it often is in Western culture where we fall back on it when all active means have failed. It is, instead, an active emotion… through which an effective relationship with the environment can be created.” Carlson explains the phenomenon in the context of the hunt: “Hope is a vehicle by which the hunter impresses his will and ability upon a contingent world of individual relationships…The hunter can express the hope that he has in the relationship between himself and the other-than-human beings on whom he relies.”[86]

This attitude, so vital to the hunt, is also a significant factor in the Omushkegowak’s persistent attachment to the muskeg. At times, Cree leave the land for work or education, but they often come back. Journalists, at a loss to explain why an educated Cree would return to an impoverished community, simply pronounce that there is no rational explanation for why people are attracted to home.[87] Deeper reason underlies the cliché, however. The question

Figure 115
Checking a beaver trap

of why Cree do not move permanently from their remote reserves is answered in part by understanding their belief in the unknown potential of the bush. It gives them hope. Even as the Omushkego derive their identity from the muskeg, the same land gives them a sense of future.

Although the way of building on the land has changed, the way of relating to it has, for many Cree, remained intact up until the present day. Despite ongoing challenges to the inheritances of latitude and perception, there is a spirit of optimism.[88] Rich epistemology persists even as mundane technology changes.

However, as we have seen, the two are intertwined, and those who would wish to contribute to the success of mundane technology do well to consider the underlying and enduring presence of a Cree worldview. That is why this background is important as we consider the contemporary situation of Kashechewan First Nation.

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"The trouble is with the foundations," explains Noah.[89] His words have an implication that goes beyond the twenty- by forty-eight-foot crawlspace in front of us.

It is difficult to build enduring structures in the muskeg. Soft soils, high water table, deep frost penetration, strong winds, and flooding are part of a landscape that erodes, absorbs and erases—or as a Cree elder explains, this land cleanses itself.[90]

Figure 116
View of community in the spring from flood dike


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About a third of the $260,000 spent building a single thousand square foot home is absorbed by the foundation. The shallow-frost protected footings require an area of excavation at least twice as large as the area of the home. While the frost protection lessens issues of frost-heave, it encourages problems with mould. In the damp muskeg, water inevitably enters the sealed and insulated crawlspaces. Moisture from the ground and heat from the floor generate the conditions for mould in the sealed space beneath the floor.

Sump pumps burn out in the high spring water tables, and the electrical components of mechanical equipment stored under the floors degrade in the damp. On occasion, sewage backs up into the low sealed space. Men in overalls and dust masks use buckets and wheelbarrows to dig out the contaminated soil and replace it with gravel from the riverbanks.

The costs associated with repair take from the budget funds needed for new housing. Homes are crowded. The birth rate in Kashechewan is around three times the national average,[91] and the population of the community is expected to double by 2030 and triple by 2050. Already, an average of eight people live in each three-bedroom home.[92] The high cost of building and the rapid deterioration of homes—usually beginning with settling foundations—limit the Band's ability to provide for the overcrowded conditions. Sadly, a few new homes stand empty, condemned due to water and mould before the first families could even move in.

Permanent foundations have limited the community's ability to adapt to changing conditions. A combination of climate change and commercial pressures to keep winter roads

Figure 117
Contaminated soil after sewage backflow

open longer have increased the effect of the spring breakup on this vulnerable location.[93] Residents remember camping out in their canoes in the protection of the inland bush when floodwaters first filled the community in the 1970s; today, however, not everyone owns a boat, and the diked community frequently needs to be partially or wholly evacuated in the spring. In the past nine years, the community has been evacuated six times due to flooding. They have considered moving upriver to higher ground, but no action has yet been taken.[94] Problematically, money invested in infrastructure and housing now ties the First Nation more firmly to their dangerous location; if they move, this value will be mostly lost.

The foundation is a locus for many of the community's difficulties. However, the foundation is also remarkable in its potential to awaken a sense of community pride, and possibilities.

The foundation is powerful in Kashechewan because it relies on stories. To learn how to build a foundation in the muskeg, one needs to hear many stories—of how cold the winters can be, how the water table moves in the spring, what happened when they built the church basement, of what used to be in a particular location. The site of the foundation is hidden, especially from the newcomer, and it requires the combined knowledge of those who have walked the land, dug in it or pressed poles into it, and seen how it has changed. Each builder has something to say, partly because foundation-building is difficult and difficulty makes for a good story; and also partly because these stories relate to the land which is their significant and common interest. Each local Cree has something valid to contribute to an understanding

Figure 118
Mould in crawlspace

of the variable character of the muskeg.

The foundation is the most difficult component of the building, but because of this it is the most inherently local: while the structure above grade can be any standard box, the foundation requires local consideration, inventiveness and knowledge to be workable. Light timber frame construction methods may be imported from 19th century Chicago, and the timber they use grew in the south, but the task of foundation-building in the muskeg relies on indigenous knowledge.

The foundation is tactile. It is not like a wall assembly which deals with abstract issues of dew point or vapour drive. Rather, the foundation is about movement—of ice, water, and structure—and many Omushkego have deep appreciation for the movement of these materials. They know the power of their land, and any solution to foundation-building must pay its deference to their territory.

The Omushkego have a long history in the Lowlands, and they are aware that they address an age-old challenge when they build. To build in the muskeg is to share in the experience of their ancestors. Many new types of foundations have been attempted, especially in recent decades, and local builders are aware of the advantages and disadvantages of each one.

Since before the 1950s, elders built on top of timber box cribs. The heavy wooden piers were made from locally cut trees. The piers were strong, easy to level, and elevated homes above the wet land. When running water was installed in Kashechewan in the 1990s, the spaces beneath houses were enclosed as crawlspaces to protect the pipes from the cold, and

Figure 119
Meltwater against pressure-treared wood foundation

crawlspaces became a standard part of housing design in the community. Many of the first homes with crawlspaces were founded on pressure-treated boards, and have minimal or no frost protection: they sink into the spring slush and heave each winter.

Forty houses were constructed in 2000 with full basements. These foundations lie below the frost line, helping to keep the buildings stable; unfortunately, these basements commonly flood in the thaw. Other homes are lifted out of the wet on helical piles, but wobble in the soft muskeg when trucks pass or strong winds blow, despite all attempts at cross-bracing.

The crawlspaces currently in use, founded on heavy concrete footings and protected with insulated skirtings, are fairly stable. The space under the floor absorbs a lot of energy, however, and the warm, wet, sealed environment fosters mould growth. The mould is an insidious issue, but heat loss can be addressed: locals often pile snow around the perimeter of their houses to keep their floors warmer. The southern crawlspace is indigenized by actively connecting it with the seasonal cycle, as the Cree use the possibilities of the land to address its challenges.

Increasingly, the community is eager to demonstrate their knowledge of the land. Many are also eager to change their relationship with engineers and architects from the south, frustrated by the lack of coordination with local knowledge. These community members and leaders propose to stop relying on outside services, confident that they can do a better job of deciding how to build in their own territory.

The foundation is a local, tactile, and comprehensible challenge which community

Figure 120
Formwork for strip footings.

members can contend with in addressing the larger political forces at work on their lands. From many quarters, there are calls that the Omushkego should not continue founding on the land at all. Journalists, resource extractors, and political advisors have questioned the sustainability of these remote reserves. Notably in Kashechewan, a 2006 government-commissioned report advised that the community be relocated from their land of peat, bog and marsh to the fertile clay belt of northern Ontario, where prospects of employment and schooling were better.[95]

Kashechewan First Nation responded with a report titled Voices of the People.[96] The Band was not willing to consider the possibility of leaving the land that their ancestors had occupied "since time immemorial."[97] The present position of many community members, including builders and Band Councillors, is to take over responsibility for building, as a meaningful assertion and essential measure to protect Cree habitation on their own territories. The high costs of construction and building repair, as well as the overarching impacts of substandard housing on so many aspects of life, imply a burden of proof that rests upon the foundation.

Figure 121
House raised on timber cribbing

As an architecture student in James Bay, I find myself like the earliest traders, relying heavily of Cree generosity in learning how to found on the James Bay Coast.

Builders are generous storytellers. In the community, as an excavator runs, a man leans on his shovel and points out the depth of hardpan clay in the earth section the bucket has made for us. He describes how the water table changes in depth within different area of the community, and throughout the year. He is joined by a friend, and they proudly describe the time that they showed a project engineer how to drain water from the excavation pit to build the basement walls of the local Anglican Church.

On his lunch break, another builder takes me in his truck out to Half Kash. He grew up here with his grandfather, and explains that people settled on this site before moving downstream below the rapids where the government barge could land. The land is high and beautiful: this is where people come to have their wedding photos taken.

The few houses in Half Kash are empty, but one is new. An elder, tired of the springtime evacuations, overcrowding, and politics of housing, has bought himself a one room house. It sits on a huge steel sled, but over the next several weeks, builders will lift the dwelling and install a new foundation beneath it.

Figure 122
Building a foundation outside of the community

Like this elder, many Cree believe that building on their own, even outside of the reserves, is a wise way to ensure their continuity on the muskeg, eschewing certain modern

conveniences and standards. Another elder from a more remote Lowland community, storyteller and former chief Louis Bird from Peawanuck (formerly Winisk), explains that even "we, the most isolated communities like Winisk and Fort Severn on Hudson Bay, have accepted the housing with is high standard in Canada, the national housing. So we live by that housing, in those houses, and it controls us."[98] Certain Cree, old and young, see reliance on housing from the south as ultimately impossible in their context. Instead of allowing their relationship with the land to be eroded by 'national housing' and the wage economy that inevitably accompanies it,[99] these individuals wish to reduce dependence on the south by forgoing its trappings, living out in the bush once again.

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For other community members, moving back to the bush seems less desirable. Even still, they seek ways to overcome the cultural unfamiliarity of fixed, elevated, rectangular housing. An elderly woman in Kashechewan, whose husband is not able to travel easily in the bush, asked her three sons to build a tipi in their backyard. Since the structure's completion, it was occupied each evening for weeks, and often in the day as well, by extended family and friends. This elderly couple has a welcoming single-storey house, and their granddaughters are proud to show it to newcomers, but the bungalow does not have the same associations as the tent, whose foundation on the soil has a meaning both timely and enduring.

Figure 123
Family in tipi, skinning marten, smoking goose, baking potatoes, making coffee
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A builder in fingerless gloves and sunglasses tests my knowledge against his own considerable understanding about building science and construction. He has been to college and, like many young men, is taken with the challenge of building.

By salvaging scraps from job sites, this young father has been able to add a second storey onto his home. He invites me upstairs to show me his innovations and ask for my opinion. Coming to a window he directs my eye across the ridges of repeated, identical houses. He used to live next to a shallow lake, he explains, until they added fill and built houses. Now the structures are all sinking, and the dip across the roofs highlights the former bathography of the lake, showing the effect of the muskeg on this imported solution.

Like a newcomer from three hundred years ago, I bring him a book, and he is intrigued by the message although ready to interpret his own meaning into it. But it captures his imagination. The principles seem workable to him. We build a formwork together for a precast concrete pier: he will cast these and install them before the winter, as both an experiment and hopefully the future foundations of a small business he wishes to start. The book is a tool, which he can use in building new foundation for the community.

In a context where entrepreneurs fly in regularly to promote their particular packages for the reserves' problems, for everything from structurally insulated panel systems, container houses, or helical pile augers, the book is intended as a tool that he can appropriate, to aid in honing skills and guiding the building of new foundation for the community.

Figure 124
Constructing a foundation formwork

Out on the water, thirty-five miles upriver, we race along the high banks of Site Number 5. Following media attention surrounding flooding evacuations and the *E.coli* outbreak of 2005, Kashechewan First Nation negotiated a deal with the Liberal federal government to relocate to this natural levee on their traditional lands, which flood waters will never inundate.

The deal fell through when the Liberals lost power, and the subsequent Conservative government decided that the cost of re-establishing was too high. The possibility of relocating to a site within their traditional territories, however, continues to be discussed within the community—especially, naturally, in the spring.

Back in the community, Band Councillors and Housing Department staff leaf though the Draft Building Options book at their leisure, pausing in particular at the comparison of total weight for various foundation systems. Weight is significant for two reasons: firstly, shipping charges apply an automatic thirty percent premium on building materials, so reducing weight significantly reduces project costs; secondly, in the long term, the idea of building light houses leaves the possibility of relocation more open.

In the community's past, small houses were moved easily from location to location as needed. The oldest building in the community, now in Half Kash, was dissembled and floated across the river when Cree from Fort Albany moved to the north side of the Albany River in the 1950s. The act of moving dwellings has remained part of the Cree heritage until relatively recently, and remains well within the scope of their cultural context. Light construction offers one means of keeping the question of migration open for now, allowing

Figure 125
The high banks of Site No. 5

the community to meet a housing need without tying them unduly to their dangerous location.

These are foundation stories, and they provide evidence that the deep-set hope that Cree have in their territory is founded. Omushkegowak continue to negotiate and maintain connections with their lands, finding ways of building upon the muskeg that satisfy physical, cultural, and economic needs.

This text has followed a careful trajectory to bring us to this place. Beginning in the absolute centre of the Western world, Rome, we shifted to its periphery in the low-lying delta of the Rhine. Rome was unable to lastingly transform this environment; but imaginative, indigenous foundations contributed to making population of the Netherlands possible, comfortable, and meaningful.

Now we have shifted to a new frontier, still further from Rome. In this pristine territory of soft muskeg, it is clear that to maintain the myth of enduring foundations is to perpetuate the story of Romulus in a place that it does not belong. Much has been demanded in sacrifice beneath the fixed foundations of Cree reservations: a way of life in the bush, family structures, traditional knowledge. Unlike murdered Remus of Roman mythology, however, the Cree have survived, and have resolved many of the complexities of cultural imposition creatively. They have maintained their own open-ended narratives in the face of Romulus' story, affecting its outcome.

Ab condita carries multiple meanings. Ostensibly, it considers that which is derived from

Figure 126

Cabin from Old Post, deconstructed, transported across the river, and re-erected in the 1950s at Half Kash, where it stands today.

the foundation, but it carries a contrary seed. *Ab* is 'from', and it is also 'away'. 'From *condita*' glorifies the foundation; simultaneously, 'away from *condita*' mistrusts it, and even flees from it. *Ab* reminds us to watch for that which is cast away—*abject*—in the founding, not only that which is supported. In the context of James Bay muskeg, *Ab condita* affirms an impulse away from the continual sacrifices required for foundation-preservation: here, the Trickster makes a better hero than Romulus.

Recognizing the nature of the foundation in the subarctic Lowlands confronts southern underlying assumptions, while pointing to the inherent latitude and potential of the land. When we interpret the foundation as a site of negotiation, we are given the opportunity to reappraise our founding myths. Instead of focussing on a narrative of Romulus and the seemingly indelible ichnography of Euro-Canadians on Aboriginal culture, this foundation story begins with the enduring yet variable substance of muskeg, and shows how newcomers have been softly filtered into it. On this great and subtle foundation, ideas are exchanged, even while continuity is at work. As of yet, this story remains open-ended, but lasting patterns of resourcefulness and hope lie underlie its telling.

1 Carlson notes that this drawn-out discussion between a native population and their colonizers is 'rare if not unique.' 13.

2 Carlson xviii.

3 Norman 7.

4 *Ibid.* 22.

5 *Ibid.* 5.

6 McLeod 53.

7 *Ibid.* 52. Neal McLeod provides a beautiful description of the Trickster and open-endedness in Cree narrative, which has influenced the writing of this text.

8 Cf. Kay, "Lessons from Kashechewan"; Gough, "All the lost boys and girls." "I realized that very little native culture remains today in sub-Arctic Canada. Once, small bands of nomadic Cree roamed the territory, hunting, fishing and gathering. Today, most live in villages year-round in pre-fab houses, unemployed, on welfare and getting their highly processed food at the Hudson's Bay store."

9 For this astute and beautiful phrase, I am indebted to Jonathan Clapperton in his review of Carlson's *Home is the Hunter.*

10 Cf. Platinex para. 80: "The relationship that aboriginal peoples have with the land cannot be understated. The land is the very essence of their being. It is their very heart and soul. No amount of money can compensate for its loss. Aboriginal identity, spirituality, laws, traditions, culture, and rights are connected to and arise from this relationship to the land."

11 Bird 42.

12 Carlson 46.

Figure 127
Erosion of the riverbank

13 *Ibid.* 44.

14 Perhaps a Western parallel can be found in the way that, for the Romans and to some extent for us, the anniversary represents the 'same day': March 1 during the reign of Augustus is the 'same day' as March 1 of Year One, even though the times are separated by centuries. The tipi is the same space, despite being relocated geographically: it carries all of the significance, atmosphere, memories, associations—and people—of the remembered structure.

15 Carlson 51.

16 McLeod 47.

17 Lytwyn 202.

18 Carlson 67.

19 Lytwyn 136.

20 Carlson 74.

21 Lytwyn 15.

22 *Ibid.* 37.

23 Carlson 85, Lytwyn 203.

24 *Ibid.* 52.

25 Carlson 83.

26 *Ibid.* 59, 62. "Acceptance of local decisions was a part of living in James Bay."

27 Carlson 43.

28 Lytwyn 156, 191.

29 *Ibid.* 204.

30 *Ibid.* 201.

31 Carlson 77.
32 Bird 213.
33 Carlson 103
34 Bird 215.
35 *Ibid.* 224.
36 McCarthy 59.
37 Hutchinson.
38 Carlson 108. However, see also Stevenson 19-24.
39 In fact, McCarthy suggests that the Cree nation became 'fully literate' within a decade, from 1841 to 1851, and that literacy rate were higher among Cree than among French and English communities at that time. McCarthy 59.
40 Carlson 47, 101.
41 Long (1989), 23.
42 Carlson 147.
43 Berkes 207, 211
44 Morrison 42.
45 *Ibid.* 39.
46 *Ibid.* 46.
47 *Ibid.* 45.
48 *Ibid.* 46. "The province had a simple negative answer for bands that wished to alter their reserve sites."
49 *Ibid.* 45.
50 Especially inspiring is the story of Shannen Koostachin, who began a 'Students

Helping Students' campaign for a school for Attawapiskat. The school has been built, and the campaign continues to raise awareness about inequitable funding for First Nations school children. Cf. "Shannen's Dream."

51 Rogers 130.

52 "A History"

53 As indeed it was. Gnarowski notes the irony that despite the devastating effects of schools among the James Bay Cree of Quebec, it created a generation that was savvy to the ways of the southern bureaucracy, as well as friendships, which in great part contributed to their success in resisting the hydro development. Gnarowski 118.

54 "Education" 193. Cf. Igloliorte 38, Gnarowski 116.

55 "Important Dates"

56 Hookimaw-Witt 119.

57 *Ibid.* 139. Cf. Gnarowski 116.

58 Miller (1996) 170.

59 Hookimaw-Witt 140.

60 *Ibid.* 118.

61 *Ibid.* 120, 138.

62 Hatch Acres 11.

63 Bird 28.

64 Urquhart.

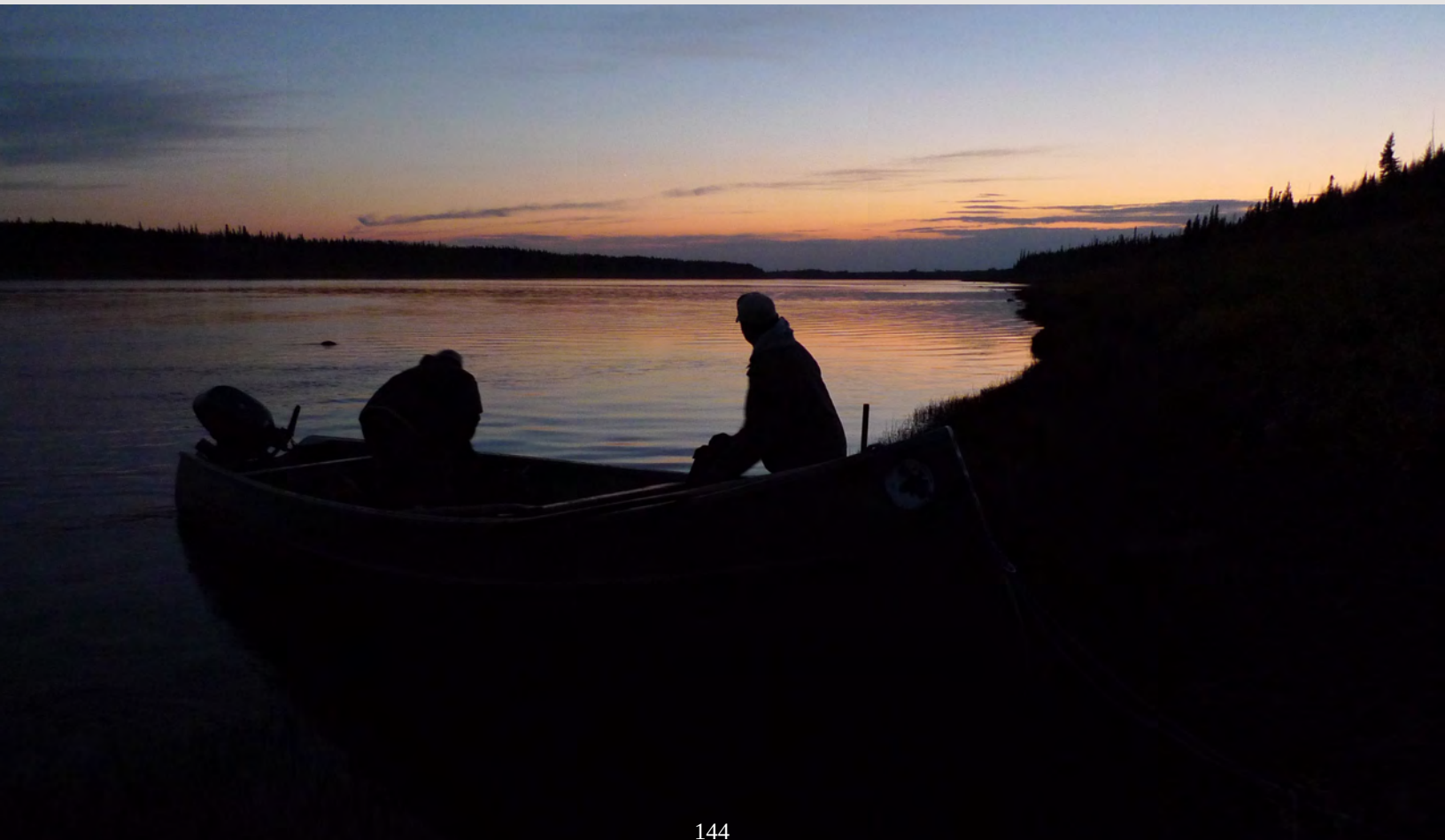
65 Miller (2011), 20.

66 Berkes (1996), 358.

Figure 128
Preparing a marten skin

67 McKie.
68 Metatawabin.
69 Kudelik.
70 Freeman.
71 Ross.
72 Tollinsky.
73 Berkes (1997), 198.
74 Saul 63.
75 Hookimaw-Witt 11.
76 Saul 81.
77 *Ibid.* 48, Brody (1981) 276.
78 Cf. Vowel (2012).
79 Berkes (1997) 212.
80 Carlson 86.
81 Lytwyn 143.
82 Long (1993), 42. "To the Cree, a generous person was one who shared especially food, with relatives, the elderly an those in need and did so without expectation of any tangible return."
83 Cf. Berkes (1996), 358.
84 Carlson 82.
85 Lytwyn 204.
86 Carlson 56.
87 Cf. Corbett: "Sometimes there is no rational explanation for the concept of home."

Figure 129
Unloading at Site No. 5



and Kay (2013): “Edmund [has] lived, studied and worked in Edmonton, Toronto and Peterborough, Ont. But a quarter-century ago, he felt the call of home…”

88 Cf. Kay (2011), (2012), (2013). Note a change in focus after Kay visited the North.

89 Names have been concealed to protect privacy—except this one.

90 Cf. Lytwyn 27. “Riverways washed away by the scouring action of ice and water during the spring breakup. Camps built on higher ground were exposed to the erosive action of wind, rain, and snow.”

91 Shimo.

92 Interview with Deputy Chief Amos Wesley, based on research by planningAlliance Inc. Kashechewan: Saturday 27 May 2013.

93 Pope 5.

94 *Ibid.* 27.

95 Pope 32.

96 “Bid.”

97 Bird 40.

98 *Ibid.* 225.

99 Berkes (1997) 212.

Figure 130
Foundation-building

Foundation II

The foundation is a response to the earth. The material of a foundation reveals its builders' trade routes, geographic origins, and the degree to which they regarded themselves as a part of their landscape. Groundwork is a conciliation of biology and geology: the horizon deforms to accommodate dwelling, while substructures propagate characteristics of surrounding earth far into a building's form. Density and consistency of soil affect material, ornament, the size of spaces, light, and acoustic quality above grade. As the foundation carries the impression of the building to the earth, the earth is also impressed upon the building.

The foundation is a response to time. Foundations are first to be built; first or last to degrade. The interaction of foundations and the ground's surface records duration in earth's slow time. Partially sheltered from the erratic destructions of war, fire, and renovation, the foundation is measured in even increments of seasons: each frost, flood, and migration registers its traces.

The earth contains the part of the building that the body cannot measure: a foundation's buried depth, like time, shapes encounters without being directly encountered itself. In foundation-building, material moves with the flow of entropy that returns all things to the earth. Unlike structures above grade, whose existence is signalled by obvious erection and collapse, the foundation disappears gently. It is unsurprising that the event of foundation-building is so often linked to expressions of human mortality.

Cultures have read tremendous meaning into this action—this primal convergence of body, landscape and material. At the turning point of architecture, when conception first becomes construction, we read of weeping and shouts of joy. Pits dug against foundation posts are sacred spaces. The foundation is a site of augury, sacrifice, trembling, and atonement. The foundation lies at the limit of experience and knowledge.

Architecture is dimensioned, quantified, proportioned and controlled, but where it touches the material of the earth it reels in the immensity of scale. Construction begins with an act of letting go, trusting future weight to an invisible substrate. The earth becomes a reckoned material, an extension of the deliberate world—but geology remains mysterious. In its vastness it hosts powerful forces. In its strata it carries traces of the past and hints of the future. Half-buried, the foundation belongs to visible and invisible worlds. It is a product of craft and technique, but also of ambition, desire, epistemology, and perceptions. Builders and architects betray their fears and aspirations when they are confronted with the unknown.

The lowest layer of the foundation is a witness to one of two conditions: either trust or exhaustion. It is a sign that builders believed that they had gone far enough, or that they could not go further. Curiously, the Romans give the greatest sense of exhaustion with their endlessly deep foundations, while the foundations of the Cree, dwelling lightly, express trust despite variability in the muskeg.

In the face of uncertain landscapes, uncertain futures and even uncertain pasts, foundation builders have responded to not knowing in various ways: Ancient Romans looked to mitigation of soil variation through deep and wide foundations; inhabitants of the Netherlands, to optimization; Omushkego, to adaptation. Contemporary Western construction seeks to eliminate uncertainty, but this is not entirely possible. Technology minimizes doubt on a local scale, with drill samples and vibration testing to determine the conditions of the ground, but large-scale threats such as widespread flooding press to the fore. Valuable archaeological finds are uncovered unexpectedly, and projects must inflect accordingly. New foundations respond to ongoing new uncertainties.

The foundation today remains a site of mystery. Overbuilt factors of safety are a contemporary acknowledgement uncertainty. Deep, high, and thick foundations may seem to separate human occupation from the uncertainty of the soil, but in the end such constructions only betray provision in the face of the unknown. The foundation always connects us to the unknown. Even when we have excavated and bored holes in it, the essential condition of the earth remains a topography, with knowledge above and belief below. The soil beneath the last shovel, the aggregate beyond the depth of the core sample, is imagined.

As architects, perhaps one of our most profound and humble roles is in designing foundations. In many cases their remains are preserved—foundations are the lasting signature of architecture; the most diverse ‘drawing’ collection in the world—but the inheritances that foundations preserve are often as profound as they are intangible.

The three cultures studied have all have cultural force, defining Western history, propelling 17th century innovation and discovery, or offering alternative ways of seeing to contemporary society. Notably, all three cultures looked to the long term when building foundations, in their own ways. Enduring material, enduring labour or enduring perception provided means to transcend generations.

In a society obsessed with surface, the significance of the foundation

may be neglected. Some buildings are connected to the land with physical structure, but nothing more. Designers shuffle a once-sacred duty to other designers, and architects ignore the substructure in favour of visible details.

However, foundations remain the invisibles structures of the surfaces we touch, and history reminds us that they are the eventual surfaces we experience. The foundation shares lessons with those who take note. In a world that takes for granted the remanufactured landscape, the foundation reminds us of the geological forces which underlie all of our efforts. In a world that celebrates endurance, it is critical to consider cultures that have dwelt successfully since time immemorial, preserving only their experience of the land. In a world of prescribed solutions and codes, a history of foundations reveals the potential of reimagined techniques to transform places. In a world charged with the time of 'now', the work and inheritance of the foundation is shared across generations. By approaching the foundation, we breech the divide that separates us from the past. The foundation has the power to set in motion new narratives, or to carry a faltering narrative towards a longer future. To value the foundation is to honour what is obscure but essential: the hidden work of the builder, the processes of time, the lives of those who once dwelt where we are. The foundation, whether deep or transient, is always connective.

The foundation acquaints us with what is not wholly known. In its half-buried state it reveals some of the mystery that surrounds it. However, the foundation maintains a sense of allure and potential equal to the uncertain land, past, and future in which it is immersed. The foundation is a site of unknowable promise.

Afterword

I have visited Kashechewan First Nation two times, for a week in April and a month in the autumn of 2013. During my last visit, I compiled a book of details, assemblies and strategies that may be appropriate for coastal communities of the James Bay Lowlands. The book was based on conversations with band councillors, elders, builders, and community members. At the end of my most recent visit, I was invited to return to the community, and was offered a ride from Timmins via winter road. I look forward to returning in February. We plan to coordinate a design charrette with the community, and will draw structures that suit that landscape and lifestyles of the Omushkego, beginning with the unique conditions of the muskeg.

Appendix

Herefollows the cover and first six pages of a draft copy of

"Building Options:
Assemblies, Details, and Strategies
for the James Bay Lowlands"

produced for Kashechewan First Nation
and other Coastal Communities
of the James Bay Lowlands.

Figure 131 (below)
Discussing Building Options

Building Options

Assemblies, Details, and Strategies for the James Bay Lowlands

DRAFT

for Review by Band Council
and Local Builders

Created through the generosity of Kashechewan First Nation

Acknowledgements

Sincere thanks to the people of Kashechewan for their generosity, openness, time and advice.

Thanks especially to those who explained many aspects of building in Kashechewan, including Chief Derek Stephen, Deputy Chief Amos Wesley, Sinclair Wesley, William Sutherland, George Reuben, Edward Sutherland, Redfern Wesley, Chris Mack, Chris Sutherland, Raymond Sutherland, Wayne Noah, Clarence Sutherland, Dennis Wynne, Bradley Wesley, and John Wynne.

For teaching me about the community and Cree culture I'm deeply grateful to Aaron and Anson Hughie and their kind family, as well as Sueade Spence, Rena Sutherland, and Julie Wesley.

The author wishes to acknowledge the financial support of the Canadian Polar Commission, and the hospitality of the Kashechewan Nursing Station, which made the depth of this research possible.

— J. F. B.

Limits of Liability and Disclaimer of Warranty

Table of Contents

The Lowlands

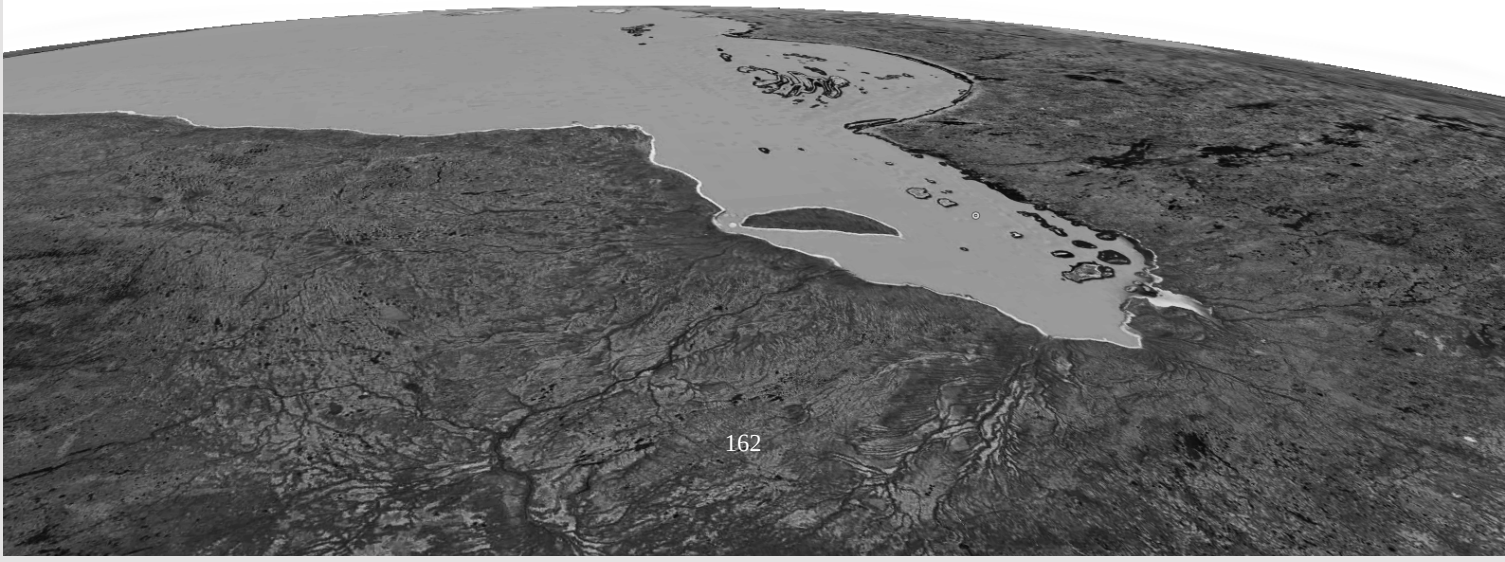
The James Bay Lowlands are a region of transition.To their south lies the fertile Northern Ontario ‘Clay Belt’, with its coniferous forests, mixed woods and agricultural land. To the north lies an immense landscape of tundra.

The Lowlands are entirely surrounded by the Precambrian Laurentian Plateau, or ‘Canadian Shield’. In contrast to that terrain of shaped bedrock, the Lowlands are filled with gravel beaches, bogs, and clay; sedge, mosses, and lichens; paper birch, stunted black spruce and tamarack. The fluvial plains of James Bay merge with the Hudson’s Bay Lowlands to form the largest wetlands in North America, home to moose, caribou, black bear, wolf, and hare, and resting grounds for migrating geese.

The area has been a long-standing site of cultural negotiation. Old Post, at the mouth of the Albany River, was one of the three oldest and most important trading posts of the Hudson’s Bay Company. The strategic location provided a route deep inland via Ontario’s longest river. Through the fur trade, two widely differing cultures met, formed relationships, and adapted their ways. Newcomers have typically relied on the expertise and generousity of Cree peoples to survive in this powerful landscape.

Today, there are five coastal communities in the Lowlands: Moose Factory, Moosonee, Fort Albany, Kashechewan, and Attawapiskat. These communities and lands are significant culturally, historically, and ecologically.

The Lowlands are an especially complex territory for building. High water tables, deep frost penetration, cold winters, strong winds, and seasonal flooding render many typical construction solutions inadequate. Building systems designed for Southern Ontario must be reconsidered in this subarctic context. It is important to develop a local architecture based on the rich understanding, knowledge and culture of people who live on this land. It can also be valuable to carefully study the climate, geography, and logistics of the region to create buildings that perform well in their unique environment.



Objectives

This book offers a collection of building details and strategies which have been designed especially for the community of Kashechewan First Nation. These sketches and notes may also be useful to other coastal James Bay communities, as they each share similar environments, and many of the same concerns.

The constructions described in these pages can help achieve four main objectives:

- avoid mould

- minimize flood damage

- improve energy performance

- decrease costs due to shipping

A final, general goal is to construct in such a way that buildings have lasting value. The cabin in Half Kash, floated across the river from Old Post, demonstrates how well a structure can age when it has been designed skilfully. Good architecture involves assembling materials with technical knowledge, as well as making pleasing surroundings that people are happy to maintain and care for.

Foundation Systems
Crawlspace

Many types of foundations have been built in Kashechewan.

Elders used to build on top of timber box cribs. The heavy wooden piers were made from locally cut trees. The piers were strong, easy to level, and elevated homes above the wet land.

When running water was installed in Kashechewan in the 1990s, the spaces beneath houses were enclosed as crawlspaces to protect the pipes from the cold. Crawlspaces became a standard part of housing design in the community.

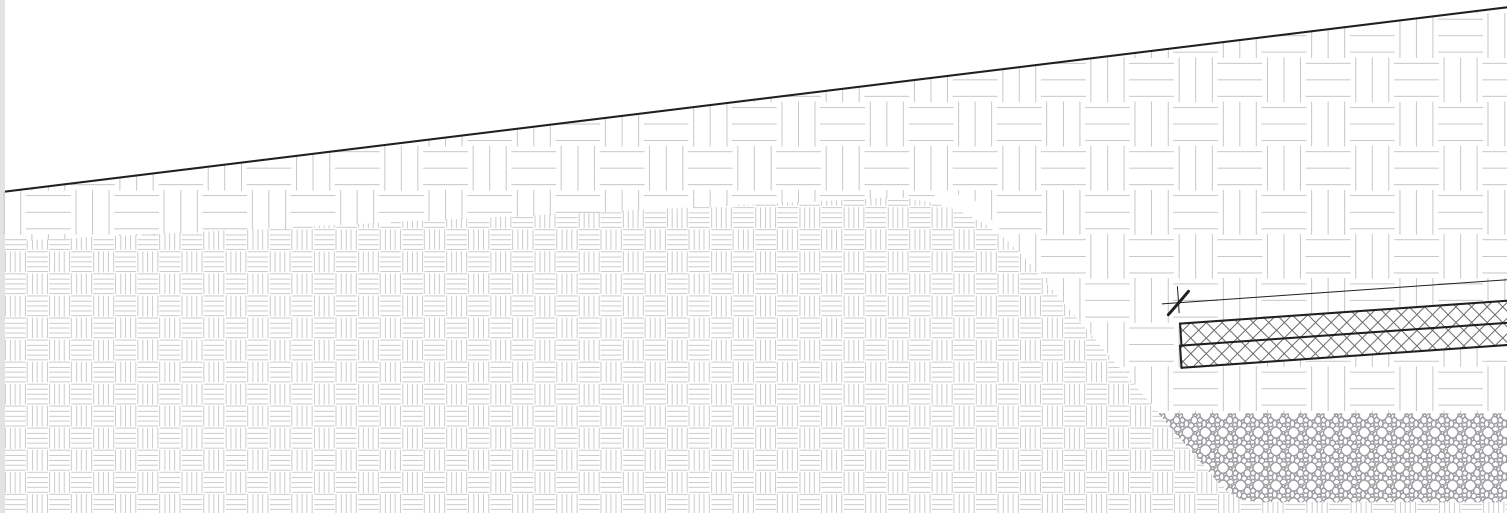
Some crawlspaces have been built on top of pressure-treated sill plates. These buildings have shifted badly due to frost heave. Better quality homes are founded on heavy concrete footings.

Forty houses were constructed in 2000 with full basements. These foundations lay below the frost line, helping to keep the buildings stable; unfortunately, these basements commonly flood in the springtime.

A typical crawlspace design, presently in use, is shown to the right.

Many aspects of this foundation design are good. The foundation is protected from frost heave with a 'skirt' of rigid insulation. A reinforced concrete strip footing spreads the load of the building onto a compacted gravel pad. Standing water inside the crawlspace is drained away through the weeping tile, and a plastic ground cover reduces the volume of moisture from the ground from entering the crawlspace as vapour.

However, there are still some problems with this design, as described on the following page.



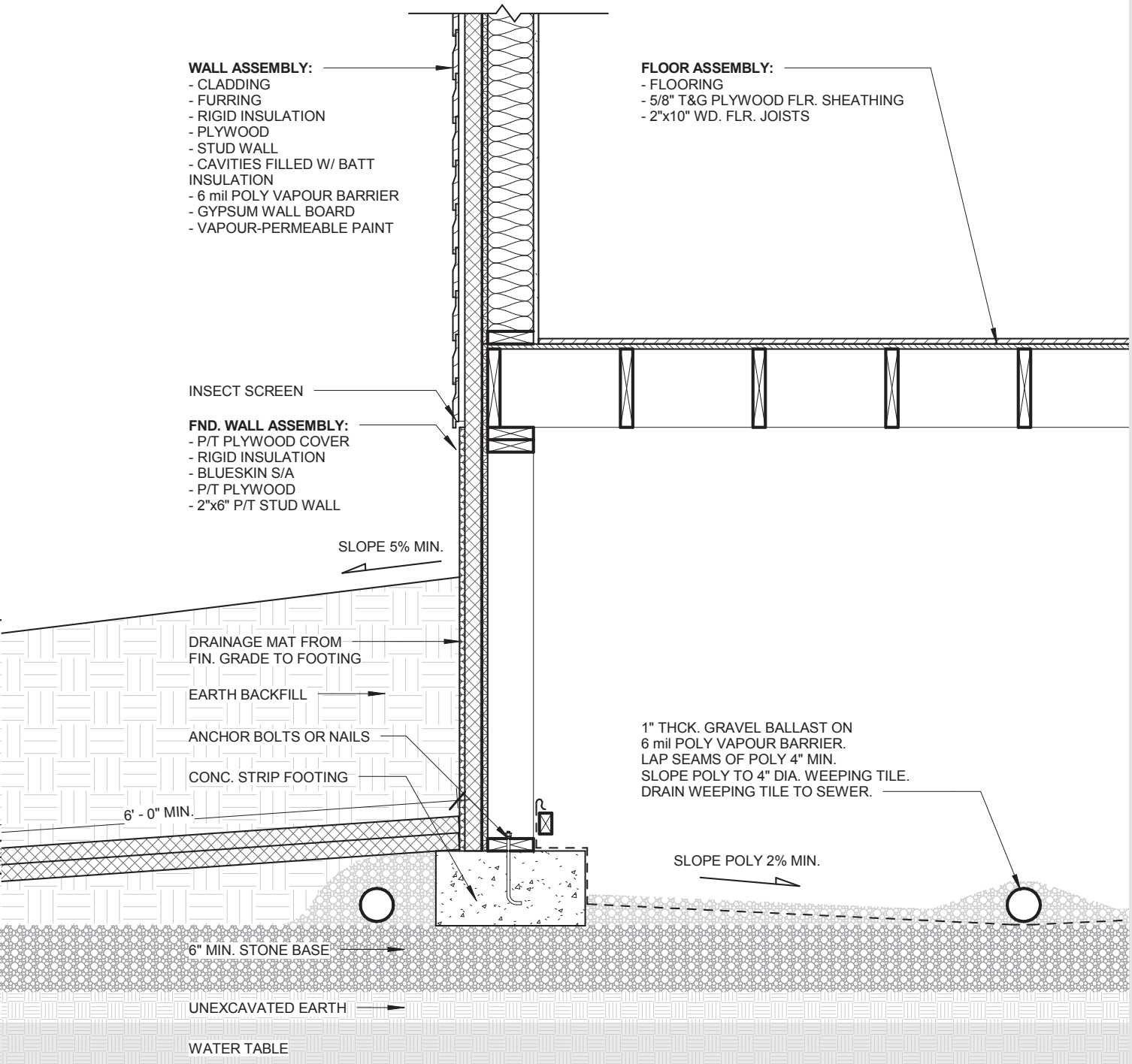

WALL ASSEMBLY:
- CLADDING
- FURRING
- RIGID INSULATION
- PLYWOOD
- STUD WALL
- CAVITIES FILLED W/ BATT INSULATION
- 6 mil POLY VAPOUR BARRIER
- GYPSUM WALL BOARD
- VAPOUR-PERMEABLE PAINT
FLOOR ASSEMBLY:
- FLOORING
- 5/8" T&G PLYWOOD FLR. SHEATHING
- 2"x10" WD. FLR. JOISTS
INSECT SCREEN
FND. WALL ASSEMBLY:
- P/T PLYWOOD COVER
- RIGID INSULATION
- BLUESKIN S/A
- P/T PLYWOOD
- 2"x6" P/T STUD WALL
SLOPE 5% MIN.
DRAINAGE MAT FROM FIN. GRADE TO FOOTING
EARTH BACKFILL
ANCHOR BOLTS OR NAILS
CONC. STRIP FOOTING
6' - 0" MIN.
1" THCK. GRAVEL BALLAST ON 6 mil POLY VAPOUR BARRIER.
LAP SEAMS OF POLY 4" MIN.
SLOPE POLY TO 4" DIA. WEEPING TILE.
DRAIN WEEPING TILE TO SEWER.
SLOPE POLY 2% MIN.
6" MIN. STONE BASE
UNEXCAVATED EARTH
WATER TABLE

Figure 132

Bibliography
Rome

Anonymous. *The Epic of Gilgamesh*. Trans. N. Sandars. Toronto: Penguin Classics, 1960. Print.

Bannister, Turpin C. "The Constantinian Basilica of Saint Peter at Rome." *Journal of the Society of Architectural Historians.* 27.1 (1968): 3-32. Print.

Beard, Mary. *The Roman Triumph*. Cambridge; Massachusetts: Harvard University Press, 2007. Print.

Beste, Heinz Jürgen. "Foundations and wall structures in the basement of the Colosseum in Rome." *Proceedings of the First International Congress on Construction History, Madrid, 20th-24th January 2003*. Ed. S. Huerta. Madrid: Instituto Juan de Herrera, 2003. PDF.

Boyle, A.J., and J.P. Sullivan, eds. *Roman Poets of the Early Empire*. London: Penguin Books, 1991. Print.

Bomgardener, D.L. *The Story of the Roman Amphitheatre.* New York: Routledge, 2000. Print.

Burrage, Dwight G. "A Visit to Hadrian's Villa at Tivoli." *The Classical Journal.* 24.5 (1929): 338-345. Print.

"condio." *Latin Dictionary and Grammar Aid*. University of Notre Dame. 20 June 2013. Web. August 2013.

"condo." *Latin Dictionary and Grammar Aid*. University of Notre Dame. 20 June 2013. Web. August 2013.

De Leonardis, Serena and Stefano Masi. "Santa Francesca Romano." *Art and History: Rome and the Vatican.* Bonechi Art and History, 1999. Print. 91.

Dyson, Stephen L. "Temple of Venus and Roma." *Rome: A Living Portrait of an Ancient City*. Baltimore: Johns Hopkins University Press, 2010. Print. 349.

Erskine, Andrew. *Troy between Greece and Rome: Local Tradition and Imperial Power.* Oxford: Oxford University Press, 2001. Print.

Feeney, Denis. *Caesar's Calendar: Ancient Time and the Beginning of*

History. Berkeley: University of California Press, 2007. Print.

Freeman, Philip. *Julius Caesar*. New York: Simon & Schuster, 2008. Print.

"From the Augusteum to the Auditorium." Archaeological Museum, Auditorium Parco Della Musica. Viale Pietro de Coubertin 30. 00196 Roma. Visited 5 April 2012. Public exhibition.

González-Longo, Cristina and Dimitris Theodossopoulos. "The Platform of the Temple of Venus and Rome." *Proceedings of the Third International Congress on Construction History, Cottbus, 20th-24th May 2009.* Cottbus: Brandenburg University of Technology, 2009. PDF.

Grant, Michael. "Roman Architecture." *Architecture of the Western World*. Ed. Michael Raeburn. New York: Rizzoli International Publications, 1980. Print.

Guarducci, Margherita. *The Tomb of St. Peter: New Discoveries in the Sacred Grottoes of the Vatican*. New York: Hawthorn Books, 1960. Print.

Hamlin, A. "Temple of Venus and Roma, Plan." *College Histories of Art History of Architecture.* New York: Longmans, Green, and Co., 1915. Print. 93.

Herodian. *History of the Roman Empire.* Trans. Edward C. Echols. Berkeley: University of California Press, 1961. Print.

Kraus, Christina Shuttleworth. "Commentary." *Livy:ſAb Urbe Condita Book VI*. New York: Cambridge University Press, 1994. Print.

Lancaster, Lynne. "Building Trajan's Markets." *American Journal of Archaeology* 102.2 (1998): 283-308.

Livy. *Ab Urbe Condita*. Trans. Foster, B. Edinburgh: Hunter & Foulis Ltd., 1998. Print.

----------. *Ab Urbe Condita Book VI*. Kraus, Christina Shuttleworth, ed. New York: Cambridge University Press, 1994. Print.

----------. *Ab Urbe Condita: Books V, VI and VII with an English Translation*. Benjamin Oliver Foster, Trans. Cambridge; Mass.: Harvard University Press, 1924.

----------. *Ab Urbe Condita Libri I – V*. Trans. Aubrey de Selincourt. Edinburgh: Penguin Books, 1961. Print.

Lloyd, Joan E. Barclay. “The Building History of the Medieval Church of S. Clemente in Rome.” *Journal of the Society of Architectural Historians.* 45.3 (1986): 197-223. Print.

Malacrino, Carmelo G. “Constructing the Ancient world: architectural techniques of the Greeks and Romans.” Los Angeles: J. Paul Getty Museum, 2010. Print.

Marlowe, Elizabeth. “Framing the Sun: The Arch of Constantine and the Roman Cityscape.” *The Art Bulletin.* 88.2 (2006): 223-242. Print.

McClendon, Charles B. “The History of the Site of St. Peter’s Basilica, Rome.” *Perspecta* 25 (1989): 32-65. Print.

Mumford, Lewis. *The City in History: Its Origins, Its Transformations, and Its Prospects*. New York: Harcourt, Brace, & World Inc., 1961. Print. 321-328, 353-356, 540-576.

Ovid. *Fasti*. Trans. A. J. Boyle and R. D. Woodard. New York: Penguin Books, 2000. Print.

----------. *Metamorphoses.* Trans. Rolfe Humphries. Bloomington; Indianapolis: Indiana University Press, 1983. Print.

Palladio, Andrea. *Palladio’s Rome: a Translation of Andrea Palladio’s Two Guidebooks to Rome.* Trans. Vaughan Hart and Peter Hicks. New Haven; Conneticut: Yale University Press, 2006. Print. 253.

Parise, Frank. *The Book of Calendars*. Facts on File, New York: 1982. Print.

Pau, A. and F. Vestroni. “Dynamic characterization of the Basilica of Maxentius in Rome.” *Proceedings of the 24th International Conference on Noise and Vibration engineering (ISMA2010) and the 3rd International Conference on Uncertainty in Structural Dynamics (USD2010), in Leuven from 20 to 22 September 2010.* Eds. P. Sas and B. Bergen. Heverlee; Belgium: Katholieke Universiteit Leuven, 2010. PDF. 729-742.

Piranesi, Giovanni Battista. *Capriccio decorativo; un gruppo di rovine popolate di serpenti, sormontato da una antica tomba; un pino di delicata morsura nel fondo; in basso a destra una tavolozza*. WikiPaintings.org. Web. September 2013.

----------. *Le antichità Romane, t. 4, tav. VI. Particolari costruttivi del Mausoleo d`Elio Adriano e del Ponte S. Angelo e loro fondamenti*. 1756. WikiPaintings.org. Web. September 2013.

----------. *Le antichità Romane, t. 4, tav. VIII. Spaccato del Mausoleo di Elio Adriano e del Ponte S. Angelo.* WikiPaintings.org. Web. September 2013.

----------. *Le antichità Romane, t. 4, tav. XXVII. Uno dei frammenti dell`antica pianta di Roma indicante la pianta della scena del Teatro di Marcello.* WikiPaintings.org. Web. September 2013.

----------. *Le antichità Romane, t. 4, tav. XIX. Pianta, elevazione e particolari costruttivi del Ponte dei Quattro Capi*. WikiPaintings.org. Web. September 2013.

----------. *Le Sostruzioni del Campidoglio e la sezione della Rupe Tarpea*. WikiPaintings.org. Web. September 2013.

----------. *Pianta delle fabbriche esistenti nella Villa Adriana, con dedica a S. M Stanislao Augusto Re di Polonia.* WikiPaintings.org. Web. September 2013.

"Plan af Rom under kesartiden. Inre staden." *Nordisk familjebok*. Project Runeberg, 2 February 2004. Web. September 2013.

Plutarch. "The Life of Julius Caesar." *Plutarch Lives Vol. VII*. Perrin, B., Trans. Loeb Classical Library Edition, 1919. Print.

Pratt, Kenneth. "Rome as Eternal." *Journal of the History of Ideas.* 26.1 (1965): 25-44. Print.

Rüpke, Jörg. "*Fasti*: Quellen oder Produkte römischer Geschichtsschreibung?" *Klio* 77 (1995): 184-202. PDF.

----------. *The Roman Calendar from Numa to Constantine: Time, History and the Fasti*. Malden; Massachusetts: Wiley-Blackwell, 2011. Print.

Segantini, Maria Alessandra, et al. *Auditorium parco della musica*: *Renzo Piano Building Workshop*. Milan: Federico Motta Editore S.p.A., 2004. Print.

Serres, Michel. *Rome: The Book of Foundations*. Trans. Felicia McCarren. Stanford; California: Stanford University Press, 1991. Print.

Simpson, Christopher J. "The Original Site of the 'Fasti Capitolini'." *Historia: Zeitschrift fur Alte Geschichte*. 42.1 (1993): 61-81. PDF.

Smith, A. C. G., "The Date of the 'Grandi Terme' of Hadrian's Villa at Tivoli." *Papers of the British School at Rome*. 46 (1978): 73-93. Print.

Steiner, E., et al. "The Interactive Nolli Map Website." University of Oregon, 2005. Web. 26 May 2012.

Tilley, Christopher. *Body and Image: Explorations in Landscape Phenomenology II*. Walnut Creek; California: Left Coast Press, 2008. Print.

Townend, Gavin. "The Circus of Nero and the Vatican Excavations." *American Journal of Archaeology.* 62.2 (1958): 216-218. Print.

Virgil. *The Aeneid*. Trans. Robert Fitzgerald. Toronto: Random House of Canada Limited, 1990. Print.

Vitruvius Pollio. *The Ten Books on Architecture*. Trans. M.H. Morgan. New York: Dover Publications Inc., 1960. Print.

Ward-Perkins, J.B. *Roman Imperial Architecture.* Harmondsworth; Middlesex: The Pelican History of Art, 1981. Print.

Wallace-Hadrill, Andrew. "Time for Augustus." *Homo Viator: Classical Essays for John Bramble*. Eds. Michael Whitby, Philip R. Hardie, and Mary Whitby. Bedminster; Bristol: Bristol Classic Press, 1987. Print.

Welch, Katherine. *The Roman Amphitheatre*. New York: Cambridge University Press, 2007. Print.

Yourcenar, Margaret. *Memoirs of Hadrian.* Trans. Grace Frick and Margaret Yourcenar. 2nd ed. London: Secker & Warburg, 1955. Print.

Zander, Pietro. *The Necropolis under St. Peter's Basilica in the Vatican*. Rome: Fabricca di San Pietro, 2010. Print.

Zetzel, James. "Looking Backward: Past and Present in the late Roman Republic." *Pegasus* 37 (1994): 20-32. PDF.

Bibliography
The Netherlands

"1675." *Encyclopedie: geologie en historie*. Ecomare.nl, n.d. Web. August 2012.

Adam J. et al. "Status and development of the European height systems." *Geodesy Beyond 2000: The Challenges of the First Decade IAG General Assembly Birmingham, July 19–30, 1999.* Ed. Klaus-Peter Schwarz. Heidelberg: Springer Berlin Heidelberg, 2000. PDF.

Alter, G. "Plague and the Amsterdam Annuitant: A New Look at Life Annuities as a Source for Historical Demography." *Population Studies* 37.1 (1983): 23-41. PDF.

"Amsterdam die mooie stad." Trans. Sjaak Breg. Shanty Bay: 2012.

Anthonisz, Cornelis. *Vogelvluchtkaart van Amsterdam.* 1544. Woodcut. Rijksmuseum, Amsterdam. *Stadsarchief Amsterdam.* Amsterdam: Gemeente Amsterdam, 2003. Web. September 2012.

Bakker, J.A. *The Dutch Hunebedden: Megalithic tombs of the Funnel Beaker Culture.* Ann Arbor; Michigan: International Monographs in Prehistory, 1992. Print.

Baron, Margaret E. *The Origins of the Infinitesimal Calculus*. Mineola; New York: Dover Publications, 2003. Print.

Beranek, Leo. "The Concertgbouw." *Concert Halls and Opera Houses: Music, Acoustics, and Architecture.* 2nd ed. New York: Springer, 2004. 425-427. Print.

"Betonnen schepen." *Hengelose-Sportduikers.nl.* Hengelose Sportduikers, 25 March 2012. Web. August 2012.

"Beurs van Berlage." *Amsterdam.nl*. Gemeente Amsterdam, n.d. Web. August 2012.

Bijlsma, Ruud. "Marken." *The Dutch Islands.* n.p., March 2004. Web. August 2012.

de Boer, Joop. "First Floating Homes Enter Amsterdam." *The Pop-Up City* 11 August 2009. Web. August 2012.

Böhm, Claudius. "History." *Gewandhaus Orchestra*. n.p., n.d. Web. August

2012.

de Boo, Marion. "Living on the Water." *Outlook.* Delft University of Technology, Delft 22.1 (2005): 18-22. Print.

Borger, Guus J. and Willem A. Ligtendag. "The Role of Water in the Development of the Netherlands: A Historical Perspective." *Journal of Coastal Conservation* 4.2 (1998): 109-114. Print.

Bot, Piet. "Heien op kleef." *Vadecum historische bouwmaterialen, installaties en infrastructuur (Handbook for Historic Building Materials, Systems and Infrastructure.)* Rijksdienst Voor Het Cultureel Erfgoed (National Office for Cultural Heritage), n.d. Web. August 2012.

Brenner, T. et al. "The Present Status on the River Rhine with Special Emphasis on Fisheries Development." *Proceedings of the second international symposium on the management of large rivers for fisheries, 11-14 February 2003, Phnom Penh; Cambodia*. Ed. Robin L. Welcomme and T. Petr. Phnom Penh: Food and Agriculture Office of the United Nations, Regional Office for Asia and the Pacific, 2003. PDF.

Brink, F. "Deeper cellars found to be feasible in the Netherlands." *International Journal of Rock Mechanics and Mining Sciences and Geomechanics Abstracts* 32.6 (1995): 295. Print.

van den Broek, Marc. "Amsterdam steggelt al over IJburg-referendum." *De Volkskrant* 7 October 1996. Web. August 2012.

Child, J. M. *The Early Mathematical Manuscripts of Leibniz.* Mineola; New York: Dover Publications, 2008. Print.

"Concertgebouw." *Arts Holland*. n.p., n.d. Web. August 2012.

Copier, W.J. "Uitbreiding Concertgebouw Amsterdam." *Cement* 1 (1987): 10-14. Print.

Council of Europe. *European Convention on the Protection of the Archaeological Heritage (Revised).* 16 January 1992, Valetta. Web. August 2012.

Curtin, Daniel J. "Jan Hudde and the Quotient Rule before Newton and Leibniz." *The College Mathematics Journal* 36.4 (2005): 262-272. *JSTOR*. PDF. July 2013.

Deltacommissie. *Working together with water: Findings of the Deltacommissie*. November 2008. PDF.

Denslagen, Wim. *Gouda*. Zwolle: Waanders, 2001. Print. 390-396.

Didde, René. "Fundering lijdt onder droogte." *Binnenlands Bestuur.* 17 June 2011. Web. August 2012.

"Digging Deeper: the Noord/Zuid line." *Iamsterdam.nl.* Iamsterdam, 19 January 2010. Web. August 2012.

Het Edams Museum. Edams Museum, n.d. Web. August 2012.

"Famous Acoustics." *Het Concertgebouw.* The Concertgebouw, n.d. Web. August 2012.

Foster, R. M. "A Critical Analysis of the Nescio Bridge, Amsterdam." *Proceedings of Bridge Engineering 2 Conference 2009.* Department of Architecture and Civil Engineering, University of Bath. PDF.

Funderingen. MonumentenWacht.nl, 2010. Web. August 2012.

Het funderingsherstel van het Concertgebouw. Dir. Robert van Alphen. Polygoon, 1986. Film.

Gaillar, Karin. *Gouds plateel, 1898-1928.* Zwolle: Waanders, 1997. Print. 14-16.

Het Gemeentebestuur van Ferwerderadeel. *De Afgraving.* Public Display. Pypkedyk 4, Hegebeintum, Fryslân. Visited 5 August 2010.

van Giffen, A.E. *De hunebedden in Nederland*. Utrecht: A. Oosthoek, 1925. Print.

"Glossary: Fundering." *Kantersgroep: Architecten, Ingenieurs en Adviseurs.* n.p., n.d. Web. August 2012.

Groenendijk, Maarten J. "Archeologievriendelijk bouwen op de Koningshof te Gouda." Gouda: Gemeente Gouda, 2009. PDF.

----------. Directie Ruimtelijke Ontwikkeling, City of Delft. Personal Interview. 2012.

Halbertsma, Eeltsje. "De Terp." *Fryslân Sjongt*. 11th Ed. Ljouwert: Laverman N.V. (1996). 49. Trans. Emile Jansen, Aaltje Dijkstra and Sjaak Breg. Delft and Shanty Bay: 2012.

Halbertsma, Ruurd B. "Forum Hadriani: Digging Behind the Dunes." *Scholars, Travellers and Trade: The Pioneer Years of the National*

Museum of Antiquities in Leiden, 1818-1840. London: Routledge, 2003. 112-127. Print.

Henry, Leonard. "Living On the Water in the Netherlands." *FloatingCommunities.com*. n.p., 17 March 2006. Web. August 2012.

"History." *Het Concertgebouw.* The Concertgebouw, n.d. Web. August 2012.

Hoeksma, Robert J. *Designed for Dry Feet: Flood Protection and Land Reclamation in the Netherlands.* Reston; Virginia: American Society of Civil Engineers, 2006. Print.

"Houten paal funderingen." *Funderingsproblemen en scheurvorming bij houten paal funderingen.* Perfectkeur B.V., n.d. Web. July 2012.

Huisman, D. J., Axel Müller and Jan van Doesburg. "Investigating the Impact of Concrete Driven Piles on the Archaeological Record Using Soil Micromorphology: Three Case Studies from the Netherlands." *Conservation and Management of Architectural Sites* 13.1 (2011): 8-30. Print.

"Hunebedden." *Midlaren.net.* Midlaarder kabinet, 2010. Web. August 2012.

"Hutkom." *Encyclopedie Drenthe Online*. Encyclopedie Drenthe, n.d. Web. August 2012.

"Infocentrum IJburg." *Wonen op Water.* OOMS Avenhorn Groep B.V., n.d. Web. August 2012.

Ingenieursgroep van Rossum. *Concertgebouw Amsterdam.* 1984. Technical section drawing. Concertgebouw, Amsterdam.

Jaarrekening: 2010. Het Concertgebouw N.V., 2010. PDF.

Janse, H. *Amsterdam gebouwd op palen.* Amsterdam: Uitgeverij Ploegsma, 2010. Print.

----------. *De Oude Kerk te Amsterdam. Bouwgeschiedenis en restauratie.* Zwolle: Waanders en Zeist: Rijksdienst voor de Monumentenzorg, 2004. Print.

----------. *Stads- en Dorpskerken in Noord-Holland*. Zaltbommel: Europese Bibliotheek, 1969. Print.

de Jonge, W., J. Bazelmans and D.H. de Jager. *Forum Hadriani. Van Romeinse stad tot monument.* Utrecht: Uitgeverij Matrijs, 2006. 217-227. 260-289. Print.

Kelly, Christopher. *A new and complete system of universal geography or, An authentic history and interesting description of the whole world, and its inhabitants.* London: Weed and Rider, 1819. Print. 346.

King, Roland. "Amsterdam Palen." *Souterrain Architect.* Architect KING, 2012. Web. August 2012.

Klaassen, René K.W.M., and Jos G.M. Creemers. "Wooden foundation piles and its underestimated relevance for cultural heritage." *Journal of Cultural Heritage* 13.3 (2012): 123-128.

"Koninklijk Paleis, Amsterdam." *Codart: Dutch and Flemish Art in Museums Worldwide*. n.p., n.d. Web. August 2012.

Kooijmans, L. P. Louwe. *The prehistory of the Netherlands Volume 1*. Amsterdam: Amsterdam University Press, 2005. Print.

Kooren, J.A. "Bouwfysische aspecten: Voorkomen en bestrijden van optrekkend vocht." *Koninklijke Nederlandse Bouwkeramiek*. KNB, October 2007. PDF.

van der Kraan, Alfons. "The Dutch East India Company, Christiaan Huygens and the Marine Clock, 1682-95." *Prometheus: Critical Studies in Innovation* 19.4 (2001): 279-298. PDF.

Lambert, Audrey M. *The making of the Dutch Landscape: An Historical Geography of the Netherlands.* New York: Seminar Press, 1971. Print.

Lendering, Jona. "Lugdunum (Brittenburg)." *Towns in Germania Inferior*. Livius.org, n.d. Web. July 2012.

Levy, Rachel. "Floating Homes Getting Attention in Amsterdam." *Deutsche Presse-Agentur GmbH* July 19, 2007. Web. August 2012.

van Loenhout, Rop. "Tweede leven Bezoekercentrum." *Attika Architekten: Projecten*. Attika Architekten, 2006. Web. August 2012.

Mak, Geert. *Amsterdam: A Brief Life of the City*. Trans. Philipp Blom. London: Vintage, 2001. Print.

McDonald, George. *Frommer's Portable Amsterdam*. Hoboken; New Jersey: Wiley Publishing, 2005. Print.

Mendonça de Oliveira, Mário and Erundino Pousada Presa. "Reinforcing foundations with wood piles: Origin and historic development." *Proceedings of the First International Congress on Construction*

History, Madrid, 20th-24th January 2003. Ed. S. Huerta. Madrid: Instituto Juan de Herrera, 2003. PDF.

"Monument." *Oude Kerk*. Oude Kerk Amsterdam, 2012. Web. August 2012.

Montgomery, Paul L. "Dutch Hail Concertgebouw's 100th." *The New York Times Online* 13 April 1988. Web. August 2012.

Mumford, Lewis. *The City in History: Its Origins, Its Transformations, and Its Prospects*. New York: Harcourt, Brace and World, Inc., 1961. Print. 321-328, 353-356, 540-576, Plate 36.

Myres, J. N. L. "The Terpen on the North Sea Coast." *The English Settlements*. Oxford: Oxford University Press, 1989. Print.

Nationale Onderzoeksagenda Archeologie. *Palaeography of the Netherlands 50 AD.* NOA, 2007. JPEG.

Nationale Onderzoeksagenda Archeologie. *Palaeography of the Netherlands 800 AD.* NOA, 2007. JPEG.

Nabielek, Kersten.. "The compact city: planning strategies, recent developments and future prospects in the Netherlands." *AESOP 26th Annual Congress, 11-14 July 2012, METU, Ankara*. Planbureau voor de Leefomgeving (Netherlands Environmental Assessment Agency), 10 July 2012. PDF.

Netherlands. Ministry of Transport and Public Works. Nederland Leeft Met Water Campaign Team. *Water in the Netherlands 2004-2005: Dutch Water Management Facts and Figures*. Den Haag: Ministry of Transport and Public Works, 2004. PDF.

Nienhuis, P.H. *Environmental History of the Rhine-Meuse Delta: An ecological story on evolving human–environmental relations coping with climate change and sea-level rise*. Nijmegen: Radboud University, Springer Science & Business Media, 2008. Print.

"Over Het Eiland." *Steigereiland.com: voor en door de bewonders van het Steigereiland*. Steigereiland.com, 2007. Web. August 2012.

"Paalfundering voorbeelden." *Bouwencyclopedie*. Joostdevree.nl, n.d. Web. August 2012.

Paul, Joop. Director of Arup Netherlands. Personal interview. Wednesday 8 August 2012.

Platform Fundering. Sichting Platform Fundering Nederland, 2012. Web.

August 2012.

Pliny the Elder. *Natural History.* Trans. H. Rackham and W. H. S. Jones. Cambridge, MA: Harvard University Press, 1975. Print.

von Petrikovits, Harald. "Fortifications in the North-Western Roman Empire from the Third to the Fifth Centuries A.D." *The Journal of Roman Studies* Vol. 61 (1971): 178-218. PDF.

van der Plas, J.C. "Vernieuwing fundering Concertgebouw Amsterdam." *Cement.* Number 2 (1987): 42-49. PDF.

"Referendum heeft ondanks IJburg wel bestaansrecht." *De Volkskrant* 22 March 1997. Web. August 2012.

Ritvo, Phyllis. *The World of Gouda Pottery*. Weston; Massachusetts: Font and Centre Press, 1998. Print. 15-39, 44-91.

Room for the River: English Site. Rijkswaterstaat, Ruimte voor de Rivier, n.d. Web. August 2012.

Rosenberg , Andrew. "Floating Houses in IJburg / Architectenbureau Marlies Rohmer." *ArchDaily* 20 Mar 2011. Web. August 2012.

Rozendaal, Marcel and Rop van Loenhout. Engineer, formerly with OOMS B.V., and Architect, ATTIKA architekten B.V. Personal interview. Tuesday 12 June 2012.

Schouten, Jan. *Gouda Door de Eeuwen*, Alphen aan den Rijn: Repro Holland, 1977. Print. 70-71.

Slomp, Robert. *Flood Risk and Water Management in the Netherlands: A 2012 update.* Rijkswaterstaat, 2012. PDF.

Smith, Woodruff D. "Complications of the Commonplace: Tea, Sugar, and Imperialism." *The Journal of Interdisciplinary History* 23.2 (1992): 259-278. *JSTOR.* PDF. 29 July 2013.

Speelman, Hugo en Joop Wilschut. "Waar is het trasraam gebleven?" *Gevel & Dak journaal* Vol. 3 (2010): 6-7, 9.

Speet, B.M.J. "Zeven eeuwen Gouda, de Gouwenaars en hun nijverheid: 10." *Ach lieve tijd*. Zwolle: Waanders, 1987. Print. 150-163.

Steenbergen, J.J.M. and R.J. van Bemmelen. "Land. If You Do Not Have It, Create It: The Case of IJburg, Amsterdam." *Irrigation and Drainage* 60.1 (2011): 4-10. PDF.

van der Stoel, Almer E.C. *Grouting For Pile Foundation Improvement.* Diss. Delft: Delft University Press, 2001. PDF.

"Summary." *Ijburg.nl.* Gemeente Amsterdam, n.d. Web. August 2012.

Suzuki, Jeff. "The Lost Calculus (1637–1670): Tangency and Optimization without Limits." *Mathematics Magazine* 78.5 (2005): 339-353.

TeBrake, William H. "Medieval frontier: culture and ecology in Rijnland." *Environmental History Series*, Vol. 7. Texas: A&M University Press, 1985.

"Terpen." *Encyclopedie*. Ecomare.nl. n.d. Web. August 2012.

Tokashiki, Ganoza. *Effects of an optimised fish passage on the foodweb of the IJsselmeer*. Lelystad: Rijksinstituut voor Integraal Zoetwaterbeheer en Afvalwaterbehandeling, 2002.

Tordoir, Pieter. "The Randstad: The Creation of a Metropolitan Economy." Eds. Willem Salet and Sako Musterd. *Amsterdam Human Capital*. Amsterdam: Amsterdam University Press, 2003.

"Tras." *Bouwencyclopedie*. Joostdevree.nl, n.d. Web. August 2012.

"De Tubex-paal." *Tubex.* Tubex B.V., 2005. Web. July 2012.

van der Veeren, Rob. *Financing Water Resources Management in the Netherlands*. Rijkswaterstaat Waterdienst, 2011. PDF.

Verhoef, L.G.W. et al. *Urban Heritage Building Maintenance: Foundations*. Trans. Lorraine van Dam-Foley. Ed. L.G.W. Verhoef. Delft: Publications Office Faculty of Architecture, 1999. PDF.

Verklarende Woordenlijst Funderingsonderzoek. Ingenieursbureau, Gemeente Rotterdam. August 2008. PDF.

Verman, W., and H. A. van Dolder-de Wit. *Gouda in oude ansichten*. Someren-Eind; Brabant: Europese Bibliotheek, 1981. Print. Plates 92-95.

Vermeer, Niels and Wouter Vermeulen. *Centraal Planbureau Discussion Paper 178: External Benefits of Brownfield Redevelopment: An Applied Urban General Equilibrium Analysis.* Den Haag: CPB Netherlands Bureau for Economic Policy Analysis, May 2011. PDF.

Vermij, Rienk and Eisso Atzema. "Specilla circulario: an Unknown Work by Johannes Hudde." *Studia Leibnitiana* 27.1 (1995): 104-121. PDF.

Vitruvius Pollio. *The Ten Books on Architecture*. Trans. M.H. Morgan. New York: Dover Publications, Inc., 1960. Print.

Wagret, Paul. *Polderlands*. London: Methuen Publishing Ltd, 1968. Print.

Ward-Perkins, J.B. *Roman Imperial Architecture.* The Pelican History of Art. Middlesex; England, 1981. 68, 97-120, 219-245.

Warren, Richard. "Staying Above Water." *Financial Times* 18 March 2011. Web. August 2012.

"Wat is het NAP?" *Normal Amsterdams Peil.* Stichting Normal Amsterdams Peil, 2013. Web. July 2013.

Waterbolk, H. T. "Archaeology in the Netherlands: Delta Archaeology." *Regional Traditions of Archaeological Research I.* Spec. issue of *World Archaeology*, Vol. 13, No. 2 (Oct. 1981): 240-254.

Waugh, Karen. "Discovering the Archaeologists of Europe: The Netherlands." *Archaeology Labour Market Intelligence Survey: 2007-8.* Reading; Berkshire: Institute of Field Archeologists, 2008. PDF.

----------. *Professional Archaeology in the Netherlands*. Amersfoort: Vestigia B.V. Archeologie & cultuurhistorie, 2009. PDF.

van der Weele, P. I. *De Geschiedenis van het N.A.P*. Delft: W. D. Meinema N.V., 1971. PDF.

"Westergo." *Lancewad Plan*. Landschap en Cultureel Erfgoed van de Waddenregio. June 2007. Web. August 2012.

Willems, W.J.H. and R.W. Brandt. *Dutch Archaeology Quality Standard (English Version)*. Den Haag: Rijksinspectie voor de Archeologie: 2004.

Witman, Bob. "Drijvend dorp op klein eilandenrijk in het IJ." *De Volkskrant* 8 December 2000. Web. July 2012.

"Working on Water: IJburg visitor centre." *H2Olland: Architecture with Wet Feet.* H2Olland.nl, n.d. Web. August 2012.

Wynia, Simon. "Gaius Was Here: The Emperor Gaius' Preparations for the Invasion of Britannia: New Evidence." Ed. H. Sarfatij, W. J. H. Verwers, and P. J. Woltering. *In Discussion with the Past: Archaeological Studies presented to W. A. van Es.* Amersfoort: Stichting Promotie Archeologie, 1999. Print.

Bibliography
Kashechewan

Abdelnour, Razek. "Albany River 2008 Ice Breakup: Forecasting the Flood Event, Observations of the River during the Spring Breakup and the Potential for mitigating the Flooding Risk of the Kashechewan and Fort Albany First Nation." *CGU HS Committee on River Ice Processes and the Environment. 17th Workshop on River Ice, Edmonton, Alberta 21-24 July 2013*. Edmonton: Canadian Geophysical Union, Hydrology Section, Committee on River Ice Processes and the Environment , 2011. PDF.

Ahenakew E. "Cree Trickster Tales." *The Journal of American Folklore* 42.166 (1929): 309-353. *JSTOR*. PDF.

Angus, C. "Shannen Koostachin." *The Globe and Mail*. 28 July 2010. Web. September 2013.

"Anxiety deepens as floods force another Kashechewan evacuation." *CBC News*. 28 April 2008. Web. September 2012.

"Attawapiskat First Nation." *Community Profiles.* Moose Factory: Wakenagun Community Futures Development Corporation, 1999. PDF.

Ballingall, Alex. "Kashechewan and Fort Albany First Nations declare states of emergency in face of flooding." *Macleans.ca*. 26 March 2012. Web. September 2012.

Barei, A. *Where the River Flows Fast*. M.Arch. Thesis. University of Waterloo, 2011. Print.

Basic call to consciousness. Tennessee: Native Voices, 2005. Print.

Battiste, M., and Youngblood Henderson, J. *Protecting Indigenous Knowledge and Heritage: A Global Challenge*. Saskatoon: Purich Press, 2001. Print.

Berger, Thomas et al. The 2010 CIBC Scholar-In-Residence Lecture. *Canada's North: What's the Plan?* Ottawa: The Conference Board of Canada, 2010. Print.

Berkes, F. and Kayo, O. "Transmission of Indigenous Knowledge and Bush Skills among the Western James Bay Cree Women of Subarctic Canada." *Human Ecology* 25.2 (1997): 197-222. *JSTOR*. PDF.

Berkes, F. et al. “The Persistence of Aboriginal Land Use: Fish and Wildlife Harvest Areas in the Hudson and James Bay Lowland, Ontario.” *Arctic* 48.1 (1995): 81-93. PDF.

Berkes, F., George, P., and Preston, R. “Envisioning Cultural, Ecological and Economic Sustainability: The Cree Communities of the Hudson and James Bay Lowland, Ontario.” *The Canadian Journal of Economics / Revue canadienne d’Economique* 29.1 (1996): 356-360. PDF.

Berkes, F. and C. Peloquin. “Local Knowledge, Subsistence Harvests, and Social-Ecological Complexity in James Bay.” *Human Ecology* 37.5 (2009): 533-545. *JSTOR*. PDF.

“Bid to move Kashechewan $500M: Documents.” *TheStar.com.* 15 March 2007. Web. September 2012.

Bird, Louis. *Telling Our Stories: Omushkego Legends and Histories from Hudson Bay.* Peterborough: Broadview Press, Ltd., 2005. Print.

Brennan, Richard. “Ottawa to rebuild troubled reserve.” *TheStar.com*. 30 July 2007. Web. September 2012.

Brody, Hugh. *The Other Side of Eden: Hunters, Farmers and the Shaping of the World*. Vancouver: Douglas & McIntyre, 2000. Print.

----------. *Maps and Dreams*. Vancouver : Douglas & McIntyre, 1981. Print.

Brown, C. H. “Indigenous Thought, Appropriation, and Non-Aboriginal People.” *Canadian Journal of Education* 33.4 (2010): 926-950.

Brubaker, Elizabeth. “Ontario Hydro: Regulating the Regulator.” *Taking or Making Wealth?* Ed. Anthony Hall. Dundurn Press, 2003. Print.

Burns, Carol. “On Site: Architectural Preoccupations.” *Drawing Building Text.* Ed. Andrea Kahn. New York: Princeton Architectural Press, Inc., 1991. 147-167. PDF.

Cajete, G. *Native Science: Natural laws of Interdependence*. Santa Fe, N.M.: Clear Light Publishers, 2000. Print.

Canada Mortgage and Housing Corporation. *Sharing Successes in Native Housing: Highlights of the CMHC Housing Awards Symposium on Aboriginal Housing*. Ottawa: CMHC, 1995. Print.

Canada. Aboriginal Affairs and Northern Development. *Ring of Fire: Information for Minister.* Unclassified. LED1918. Ottawa, 4 February 2013. Web. October 2013.

Canada. Canada Mortgage and Housing Corporation. *The Housing Conditions of Aboriginal People in Canada: Summary Report.* Ottawa: CMHC, 1996. Print.

Canada. Department of Energy, Mines, and Resources. "Canada—Indian and Inuit Communities—Ontario." Maps. *National Atlas Data Base Map Series.* Ottawa: Geographical Services Directorate; Surveys and Mapping Branch; Energy, Mines, and Resources Canada, 1983. Print.

Canada. Federal Treaty. *The James Bay Treaty: Treaty No. 9.* Ottawa: Queen's Printer, 1964. PDF.

Carlson, Hans M. *Home is the Hunter: The James Bay Cree and Their Land.* Vancouver: UBC Press, 2008. Print.

Chance, Norman A., ed. *Conflict in Culture: Problems of Developmental Change among the Cree*. Ottawa: Canadian Research Centre for Anthropology St-Paul University, 1968. Print.

"Cheers greet news that reserve will be moved." *CBC News*. 28 October 2005. Web. September 2012.

Chiotti, Q. and Lavernder, B. "Ontario." *From Impacts to Adaptation: Canada in a Changing Climate 2007*. D.S. Lemmen, F.J. Warren, J. Lacroix and E. Bush, ed.; Ottawa: Government of Canada, 2008. PDF.

Clapperton, Jonathan. "Native-Newcomer Narratives: Rethinking Culture, Environment, and the Historical Center in Aboriginal and Canadian History." Rev. of *Home is the Hunter*, by Hans Carlson. *Humanities and Social Sciences Online* March 2009. Web. September 2013.

Clay, Charles. *Swampy Cree Legends: Being Twenty Folk Tales from the Annals of a Primitive, Mysterious, Fast-disappearing Canadian Race/ as told to Charles Clay by Kuskapatchees, the Smoky One.* Toronto: The Macmillan Company of Canada Limited, 1938.

Clibbon, Jennifer. "The 'special relationship' of native peoples and the Crown." *CBC News.* 22 May, 2012. Web. September 2012.

"Community Planning Study." *Kashechewan First Nation*. 2010. Web. September 2012.

Corbett, Ron. "The contradiction that is Kashechewan." *The Ottawa Citizen* 5 November 2005. Web. November 2012.

Cresswell, J.R. "Folk Tales of the Swampy Cree." *The Journal of American Folklore* 36.142 (1923): 404-406. *JSTOR*. PDF.

Cummins, Bryan D. *"Only God Can Own the Land": The Attawapiskat Cree.* Toronto: Pearson Education Canada Inc., 2004. Print.

De Souza, Mike. "Critics say Kashechewan aid plan ignores flood reality." *CanWest News Service.* 31 July 2007. Web. September 2012.

Donnelly, C. Richard. "Holding the river at Kashechewan." *Hatch Consulting Engineers*. February 2012. Web. September 2012.

DRAFT National First Nations Housing Strategy. Assembly of First Nations, 2013. PDF.

Drukier, Cindy and Jan Jekielek. "How Could This Be Canada?" *The Epoch Times.*3 November 2005. Web. September 2012.

Dyczko, Jessi and Corey Simpson. *Developing Ontario's Ring of Fire: Possible Impacts from the Cliffs Chromite Mine.* Faculty of Natural Resources Management Lakehead University, 2012.

"Economics." *De Beers Canada Inc.: 2010 Report to Society*. 2010. Web. September 2012.

"Education." *Encyclopedia of the Great Plains*. David J. Wishart, ed. Lincoln; Nebraska: University of Nebraska-Lincoln, 2011. 193-194. Print.

Ellis, C. D., and Scott, S. *Âtalôhkâna nêsta tipâcimôwina; Cree legends and narratives from the west coast of James Bay*. Winnipeg: University of Manitoba Press, 1995. Print.

The Far North Act, 2010. *Statutes of Ontario, c.18.* Ontario. Legislative Assembly of Ontario. 2010. Print.

Faries, E., Moeke-Pickering, T., Hardy, S., Manitowabi, S. *Keeping Our Fire Alive: Towards Decolonizing Research in the Academic Setting*. World Indigenous Nations Higher Education Consortium Journal. 2006. PDF.

Faries, E., Pashagumskum, S. *History of Quebec and Canada: A Native Perspective*. Ottawa: Nortext Publishing Corporation, 2002. Print.

"Fear of flooding prompts evacuation in Kashechewan." *Wawatay News Online*. 19 May 1994. Web. September 2012.

First Nations Land Management Act (S.C. 1999, c. 24). Department of Justice. Canada. 6 July 2012. Web. September 2012.

"Flooding forces 750 from Kashechewan reserve." *CBC News*. 23 April 2006. Web. September 2012.

"Fort Albany First Nation." *Community Profiles.* Moose Factory: Wakenagun Community Futures Development Corporation, 1999. PDF.

Freeman, Sunny. "Ring of Fire Project: For First Nations, Disruption is Certain, Profit Less So." *The Huffington Post.* 30 September 2013. Web. October 2012.

Furgal, C., and Prowse, T.D. "Northern Canada." *From Impacts to Adaptation: Canada in a Changing Climate 2007.* D.S. Lemmen, F.J. Warren, J. Lacroix and E. Bush, ed.; Ottawa: Government of Canada, 2008. PDF.

Gallagher, Bill. "Will the native legal winning-streak hit 200?" *The First Perspective*. 25 June 2013. Web. August 2013.

Garrick, Rick. "Downstream communities worried for Albany River." *Wawatay News*. 16 February 2012. Web. September 2012.

Geddes, John. "They Didn't Have to Go." *Maclean's*. 14 November 2005: 90-92. Print.

Gnarowski, Michael, ed. *I Dream of Yesterday and Tomorrow.* Kemptville; Ontario: The Golden Dog Press, 2002. Print.

Gough, Laurie. "All the Lost Boys and Girls." *National Post*. 19 November 2005. Web. November 2012.

Government of Canada. Aboriginal Affairs and Northern Development Canada. *People to People, Nation to Nation.* Royal Commission on Aboriginal Peoples. Minister of Supply and Services Canada, 1996. Web.

Hanson, Erin. "Reserves." *Indigenous Foundations*. The University of British Columbia, 2009. Web. September 2012.

Hatch Acres. *Evaluation and Assessment of Ontario's Waterpower Potential: Final Report*. Report prepared for Ontario Waterpower Association and Ministry of Natural Resources. October 2005.

"A history of residential schools in Canada." *CBC News.* 16 May 2008. Web. September 2012.

Hookimaw-Witt, J. *Keenebonanoh Keemoshominook Kaeshe Peemishikhik Odaskiwakh [We Stand on the Graves of our Ancestors]: Native Interpretations of Treaty No. 9 with Attawapiskat Elders.* M.A. Thesis. Trent University, 1998. Print.

Housing: First Nations' Success Stories. Canada Mortgage and Housing Corporation. 2012. Web. September 2012.

"Housing Innovation Award: Kashechewan Major Renovation Project." *6th Annual Housing Conference 2008*. February 2008. Web. September 2012.

Hutchinson, Gerald M. "James Evans." *Dictionary of Canadian Biography*. Vol. 7, 1836 to 1850. Eds. Francess G. Halpenny and Jean Hamelin. University of Toronto Press/Les Presses de l'université Laval, 1988. Web. October 2013.

INAC. "Memorandum of Agreement and Understanding Between Her Majesty the Queen in right of Canada as represented by the Minister of Indian Affairs and Northern Development and the Minister of Health ("Canada") and the Kashechewan First Nation." *Aboriginal Affairs and Northern Development Canada*. Ottawa. 30 July 2007. Web. September 2012.

"Important Dates in the History of Attawapiskat." *Attawapiskat First Nation Education Authority.* n.p. n.d. Web. September 2013.

Indian Act (R.S., 1985, c. I-5). Department of Justice. Canada. 21 January 2011. Web. September 2012.

Igloliorte, Heather, ed. *We Were So Far Away: The Inuit Experience of Residential Schools.* Ottawa: Legacy of Hope Foundation, 2010. Print.

Johnson, J., and Murton, B. "Re/placing Native Science: Indigenous Voices in Contemporary Constructions of Nature." *Geographical Research* 45.2 (2007): 121–129.

Kashechewan First Nation. 2010. Web. September 2012.

"Kashechewan First Nation." *Community Profiles.* Moose Factory: Wakenagun Community Futures Development Corporation, 1999. PDF.

"Kashechewan evacuees head for Ottawa." *CBC News*. 31 October 2005. Web. September 2012.

"Kashechewan: Water crisis in Northern Ontario." *CBC News*. 9 Novemeber 2006. Web. September 2012.

Kataquapit, Xavier. "First Nation People Are Nomads At Heart." *Wataway News Online*. Wataway News, 25 June, 2009. Web. September 2012.

Kay, Jonathan. "For modern reserves, success is in balancing tradition and capitalism." *National Post.* 19 January 2013. Web. January 2013.

----------. "Jonathan Kay on the destitution of Attawapiskat: Close the place

down." *National Post* 30 November 2011. Web. September 2012.

----------. "Lessons from Kashechewan." *National Post*. 21 November 2005. Web. September 2012.

Kipling, Gregory and Madeleine Dion Stout. *Aboriginal People, Resilience and the Residential School Legacy.* Ottawa: The Aboriginal Healing Foundation, 2003. Print.

Kirkness, Verna J. "Aboriginal Education in Canada: A Retrospective and a Prospective." *Journal of American Indian Education* 39.1 (1999). PDF.

Kraus, Deborah, Margaret Eberle, and Joffre Pomerleau. *Case Studies of Non-profit Affordable Housing Initiatives*. Ottawa: CMHC, 1998. PDF.

Kudelik, Gail. "Albany River." *The Canadian Encyclopedia.* 2012. Web. November 2012.

La Rose, Lauren. "Kashechewan a 'community in crisis'." *TheStar.com.* 7 February 2007. Web. September 2012.

Long, John S. "'No Basis for Argument': The signing of Treaty Nine in Northern Ontario, 1905-1906." *Native Studies Review* 5.2 (1989): 19-54. Print.

----------. *Treaty No. 9: The Half-Breed Question, 1902-1910*. Cobalt; Ontario: Highway Book Shop, 1978. Print.

Lytwyn, Victor P. *Muskekowuck Athinuwick: Original People of the Great Swampy Land*. Winnepeg: University of Manitoba Press, 2002. Print.

McCarthy, Suzanne. "The Cree Syllabary and the Writing System Riddle." *Scripts and Literacy.* Eds. I. Taylor and D.R. Olson. Alphen aan den Rijn; South Holland: Kluwer Academic Publishers, 1995. 59-75. PDF.

"McGuinty visits Kashechewan evacuees." *CBC News*. 30 October 2005. Web. September 2012.

McKie, David. "Ring of Fire mining may not benefit First Nations as hoped." *CBC News.* 27 June 2013. Web. September 2013.

McLeod [Mahkîyoc], Neal. "Cree Narrative Memory." *Oral History Forum*. Vol. 19-20. Ed. Ronald Labelle. Edmonton: Athabasca University Press, 2000. 37-61. Print.

Merleau-Ponty, Maurice. *Phenomenology of Perception.* Trans. Colin Smith. New York: Taylor & Francis, 2005. PDF.

Metatawabin, E. et al. “Cumulative Disturbance in the Albany River Watershed.” *Paquataskamik*. 2011. Web. September 2013.

“Middle Shield Culture”. *A History of the Native People.* Canadian Museum of Civilization. 1 April 2010. Web. November 2012.

Miller, Gord. Environmental Commissioner of Ontario. 2011. “Hydroelectric Development in the Far North.” *Engaging Solutions, ECO Annual Report, 2010/11*. Toronto: The Queen’s Printer for Ontario. PDF. 20-21.

Miller, J.R. “Residential Schools.” *The Canadian Encyclopedia*. Historica Dominion, 2012. Web. September 2012.

----------. *Shingwauk’s Vision: A History of Native Residential Schools*. Toronto: University of Toronto Press, 1996. Print.

“Minister Duncan Announces Support for Kashechewan First Nation Housing.” *Aboriginal Affairs and Northern Development Canada*. 16 December 2011. Web. September 2012.

Ministry of Natural Resources. *Biodiversity; Hudson’s Bay Lowlands.* Ontario: The Queen’s Printer, 2010. PDF.

Ministry of Northern Development and Mines. “Kashechewan Considers Benefits Of Diamond Mine.” *Government of Ontario Newsroom*. 27 May 2008. Web. September 2012.

Minkin, Daniel Paul. *Cultural Preservation and Self-Determination Through Land-Use Planning: A Framework for the Fort Albany First Nation.* MA thesis. Queen’s University, 2008.

Morrison, James. “Treaty Research Report: Treaty No. 9 (1905-1906).” *Treaties and Historical Research Centre, Indian and Northern Affairs Canada*. Ottawa: Ministry of Indian and Northern Affairs, 1986. PDF.

“Move northern Ontario reserve south to Timmins, says adviser.” *CBC News*. 25 October 2005. Web. September 2012.

Nabokov, Peter and Easton, Robert. *Native American Architecture*. New York: Oxford University Press, 1989. Print.

Norman, Howard A. *The Wishing Bone Cycle: Narrative Forms from the Swampy Cree Indians*. 2nd ed. Santa Barbara; California: Ross-Erickson Publishing, 1982. Print

Ontario Ministry of the Environment. “Technical Report: Drinking Water

System at the Kashechewan First Nation." 10 November 2005. Web. September 2012.

"Ont. seeks places for Kashechewan evacuees." CBC News. 9 November 2006. Web. September 2012.

"Ontario to airlift 1,000 from Cree reserve." *CBC News*. 25 October 2005. Web. September 2012.

Oral History Forum. Vol. 19-20. Labelle, Ronald, ed. Moncton: Canadian Oral History Association, 2000. Print.

"Ottawa nixes relocation for flood-prone Kashechewan." *CBC News*. 30 July 2007. Web. September 2012.

Ougler, Jeffrey. "Flood threats will force James Bay First Nations to evacuate—Wawa to play host to Fort Albany residents." *SaultStar.com*. 26 March 2012. Web. September 2012.

Platinex Inc. v. Kitchenuhmaykoosib Inninuwug First Nation, O.J. No. 3140, 272 D.L.R. (4th) 727 (S.C.J.) ("Platinex"). 2006. *Ontario Court of Justice.* Web. March 2012.

Pope, A. *Report on the Kashechewan First Nation and its people.* Gatineau: Indian and Northern Affairs Canada, 2006. PDF.

"Principles to Guide our Response in Resolving the Legacy." *The United Church of Canada.* The United Church of Canada. 8 May, 2004. Web. September 2013.

Pritzker, Barry M. *Native Americans: An Encyclopedia of History, Culture, and Peoples, Volume 1*. Santa Barbara; California: ABC-CLIO Inc., 1998. Print.

"Project: Kashechewan." planningAlliance. 2012. Web. September 2012.

Querengesser, Tim. "Why should you care about Attawapiskat?" *The Huffington Post*. 22 December 2011. Web. September 2012.

Richardson, Boyce. *Strangers Devour the Land*. Toronto: The Macmillan Company of Canada, 1975. Print.

"Ring of Fire: Growing Concerns about Violations of Aboriginal Rights, Environmental Damage." *MiningWatch Canada.* n.p. 18 July 2010. Web. November 2012.

Rogers, E. and D. Smith, eds. *Aboriginal Ontario: Historical perspectives on*

the First Nations. Toronto: Dundurn Press, 1994. Print.

Rordam, Vita. *Winisk: A Cree Indian Settlement on Hudson Bay.* Nepean; Ontario: Borealis Press, 1998. Print.

Ross, Ian. "Ring of Fire junior wins strategic victory." *Northern Ontario Business.* 10 August 2013. Web. September 2013.

Salisbury, Richard F. *A Homeland for the Cree: Regional Development in James Bay, 1971-1981*. Kingston; Ontario: McGill-Queen's University Press, 1986. Print.

Saul, John Raulston. *A Fair Country: Telling Truths about Canada*. Toronto: Penguin Group, 2009. Print.

"Shannen's Dream." *First Nation Caring Society*. 2013. Web. September 2013.

Shimo, Alexandra. "My Four Months on a James Bay Reserve." *The Globe and Mail*. 6 January 2012. Web. September 2012.

Sproule-Jones, Megan. "Crusading for the Forgotten: Dr. Peter Bryce, Public Health, and Prairie Native Residential Schools." *Canadian Bulletin of Medical History.* 13 (1996): 199-224. Print.

Stevenson, Winona. "Calling Badger and the Symbols of the Spirit Language: The Cree Origins of the Syllabic System." *Oral History Forum*. Vol. 19-20. Ed. Ronald Labelle. Edmonton: Athabasca University Press, 2000. 18-24. Print.

Stirling, A. "Risk, Uncertainty and Precaution: Some Instrumental Implications from the Social Sciences." *Negotiating Environmental Change*. Eds. Berkhout, F. et al. Cheltenham; U.K: Edward Elgar Publishing, 2003. Print.

Tollinsky, Norm. "Chromite mine operator still to be determined." *Sudbury Mining Solutions Journal.* 1 March 2010. Web. September 2012.

"Uncertain future worries Kashechewan leaders." *Wawatay News Online*. 3 November 2005. Web. September 2012.

Urquhart, Ian. "Hydro plan generates controversy." *The Star.com.* 31 August 2007. Web. September 2012.

Virchez, Jorge and Brisbois, Ronald. "A Historical and Situations Summary of Relations Between Canada and the First Nations: The Case of the Community of Kashechewan in Northern Ontario." *Revista Mexicana*

de Estudios Canadienses (nueva época), No. 014 (2007): 87-100. PDF.

Vowel, Chelsea. "First Nations Taxation." *Law Language Life: A Plains Cree speaking Metis woman in Montreal.* Âpihtawikosisân, 3 December 2011. Web. September 2012.

----------. "The 'That Isn't Traditional' Meme." *Law Language Life: A Plains Cree speaking Metis woman in Montreal.* Âpihtawikosisân, 14 January 2012. Web. September 2012.

Washburn, Wilcomb E. and William C. Sturtevant. *Handbook of North American Indians: History of Indian-white relations*. Washington, D.C.: Smithsonian Institution, 1988. Print. 337.

Whidden, Lynn. *Essential Song: Three Decades of Northern Cree Music*. Waterloo: Wilfred Laurier University Press, 2007. Print.

Wiget, Andrew O. Rev. of *The Wishing Bone Cycle: Narrative Forms from the Swampy Cree Indians*, by Howard A. Norman. *Newsletter of the Association for Study of American Indian Literatures*, New Series, 3.3 (1979): 40-42. *JSTOR*. PDF.