

# Mobile Media and the Paleolithic

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October 23, 2014

The idea of this talk is to draw upon the history of “stones and bones” archaeological thought in studying media technologies, in a sense very different from the way the current field of “media archaeology” takes it, and you’ll see what I mean in a second.

I just want to preface this by saying a lot of this material I’m still learning about, and this is the first time I’ve assembled all of these objects in this way, so this is kind of an experiment. At this point I’m left with more questions than answers, so my purpose here is less to state my conclusions than set up an agenda for future research.

Situated on a hundred-acre plot along the Long Island coastline and “dropped in [what was described by the local press as] a mosquito-infested field,” the Sayville wireless plant began experiencing the seasonal interference that comes with longer days and warmer weather in May 1915. At that point little older than the twentieth century itself, wireless telegraphy (a precursor to radio) was not an entirely reliable medium.

At the rate of a dollar per word, civilians and government officials alike could relay messages from Sayville to its sister station at Nauen, Germany. In addition to commercial and diplomatic communications, Sayville sent out press dispatches every night at 9:00 that amateurs around the country tuned in to using their hand-built crystal detector sets. Receiving transmissions from the Sayville station was the gold standard for both wireless sets and their owners (who referred to themselves as ‘muckers’), as well as electronics manufacturers who regularly promised easy reception of Sayville transmissions in advertisements for their products.

The static that came with summer weather was nothing new for these wireless professionals and amateurs. Seasonal disturbances were simply a part of the natural rhythms of a new medium, even though the precise cause of this static was up for debate. Some said that radio waves experience more interference as they propagate through denser, more humid air. (There was still talk at this time of the existence of a luminiferous aether.) Others speculated that because messages came in clearer at night, the heat of the summer sun on the station’s aerials was affecting their transmitting capabilities.

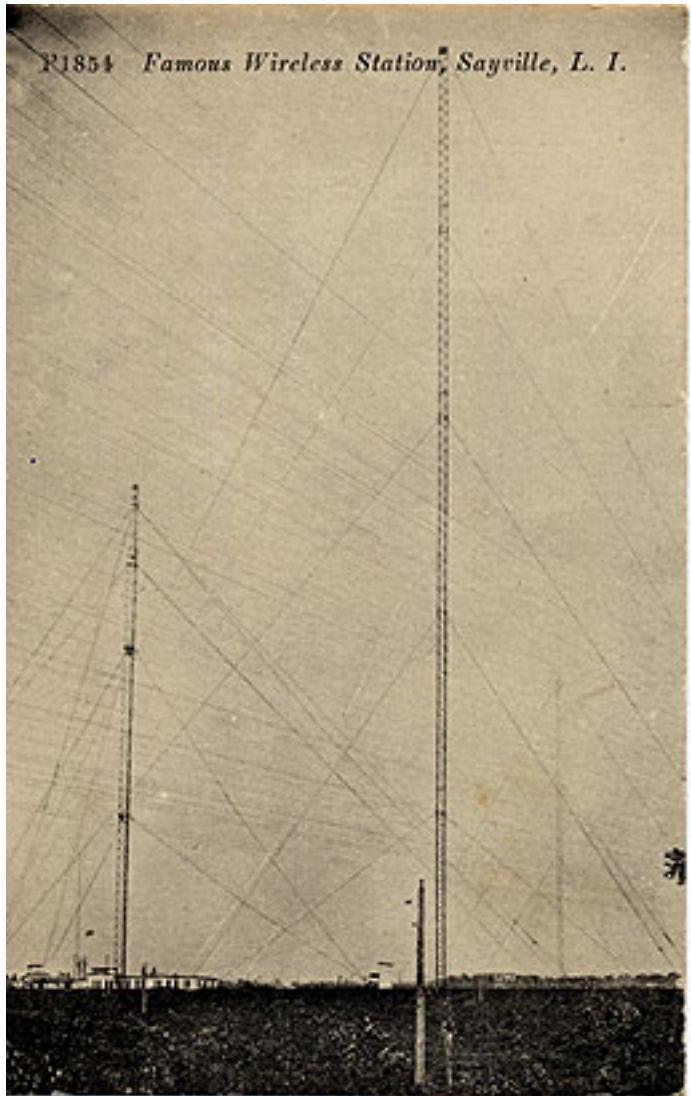




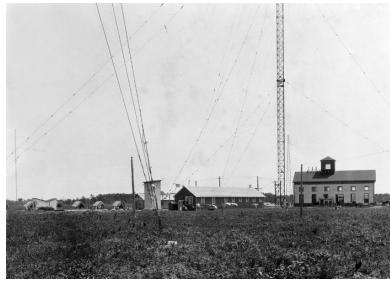
Figure 1: This photo was taken by a young blogger who actually lives in Sayville, showing what she was able to find by visiting the remains of the site a couple yeas ago.

By late summer, Sayville operators announced that interference from so-called equinoctial storms was forcing them to restrict messages to official government communications. Some commenters quipped that wireless buffs were getting cause and effect mixed up, saying that it was the electrical effects of the station itself that absorbed all the moisture, and “made Sayville dry as a Saratoga chip,” referring to the potato chip first invented in Saratoga Springs in the 1850s. Perhaps the station itself was altering its surrounding atmospheric conditions.

But this summer, Telefunken, the German company that owned the station, seemed absolutely determined not to let any atmospheric or climatic disturbances interfere with the transmission of messages between Sayville and Nauen. By June, to the surprise of the wireless community, the Sayville station could be heard clearly at much greater distances. Local observers reported that three 500-foot towers had been added to the system of aerials atop the plant. These new aerials were coupled with an increase in transmitting power from 35 to 100 kilowatts, effectively tripling the plant’s abilities.

Then, on July 7, seemingly without warning, the American government revoked the operator’s license for Sayville. That night, a force of Naval engineers and “bluejacket” sailors seized control of the plant from its German employees. Rumors surfaced that a similar takeover had been executed at the station in Tuckerton, New Jersey, which transmitted regularly to Hanover. The *New York Times* found that the decision to take control of the wireless stations had been made after a series of conferences among members of President Woodrow Wilson’s cabinet. The government had suspected that Telefunken may have been relaying signals from Germany to its U-Boats operating throughout the Atlantic. But without a record of the transmissions themselves, only a Morse code paper tape





or a transcript of the initial text, government censors didn't have the ability to analyze the messages directly.

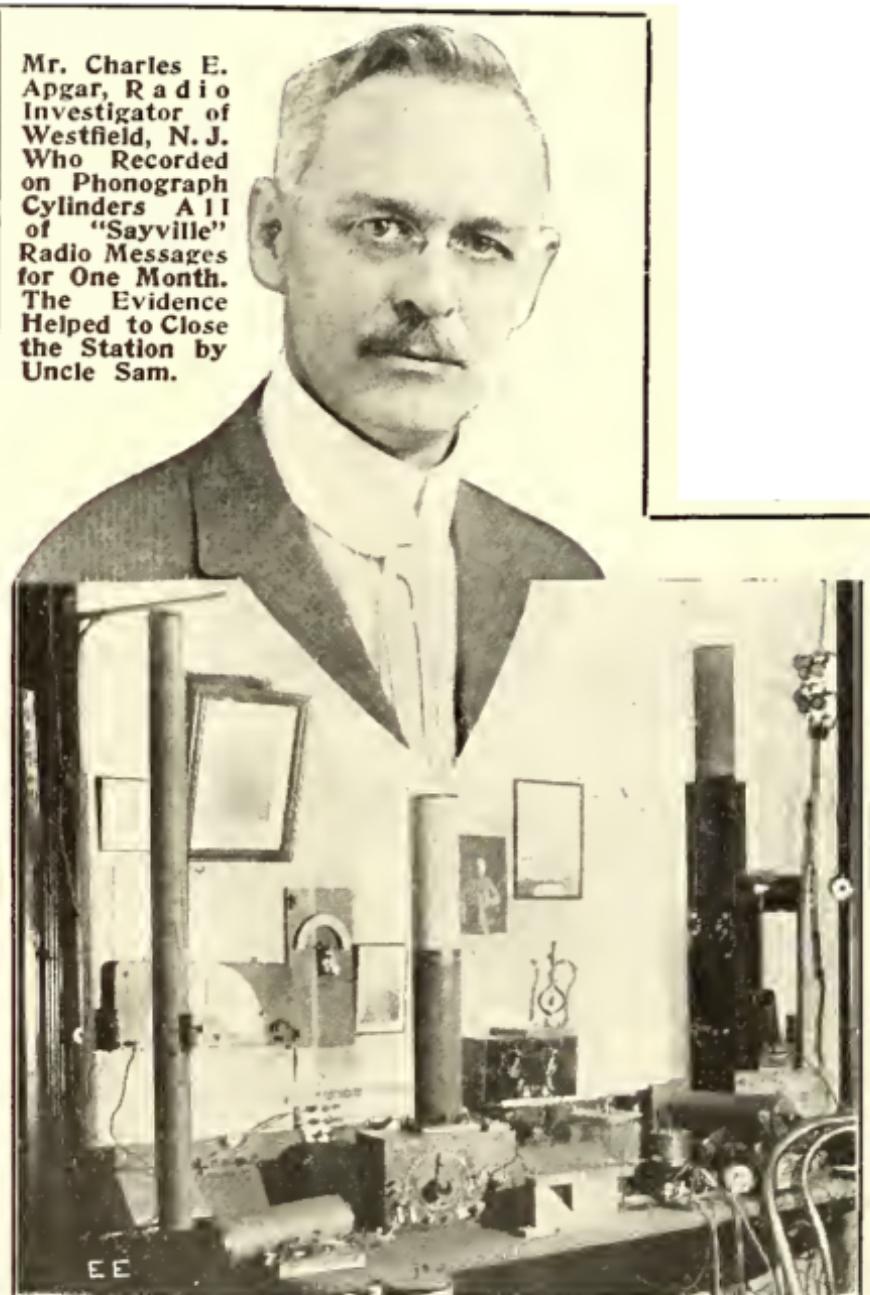
In the end, it was an amateur wireless operator, Charles Apgar, who provided the government with the evidence they needed to act. Apgar was a hobbyist new to the wireless scene who in 1913 had quietly devised the first ever means of recording a wireless telegraph signal on a phonograph cylinder. At some point, the US Secret Service became aware of Apgar's invention and immediately understood its potential. Apgar was approached by Louis Krumm, the Department of Commerce's Chief Radio Inspector about producing nightly records of Sayville's signaling.

Apgar's records allowed the government to compare the messages that were submitted for approval to the censors with the signals that actually left Sayville's aerials. Messages that seemed to contain little more than innocent commercial transactions were found to hide instructions for German submarines throughout the Atlantic. With the simple addition of a word, a space, or a minor repetition—present neither on the text submitted to the censors nor on the ticker tape produced by the machine—covert communications could be sent right under everyone's nose. In addition, Apgar's recordings captured unsigned messages flashed from Nauen to Sayville, transactions that hadn't been properly registered. Apgar's phonograph cylinders allowed an audible record of what was actually transmitted and received by the station to be poured over and decrypted by the Secret Service.

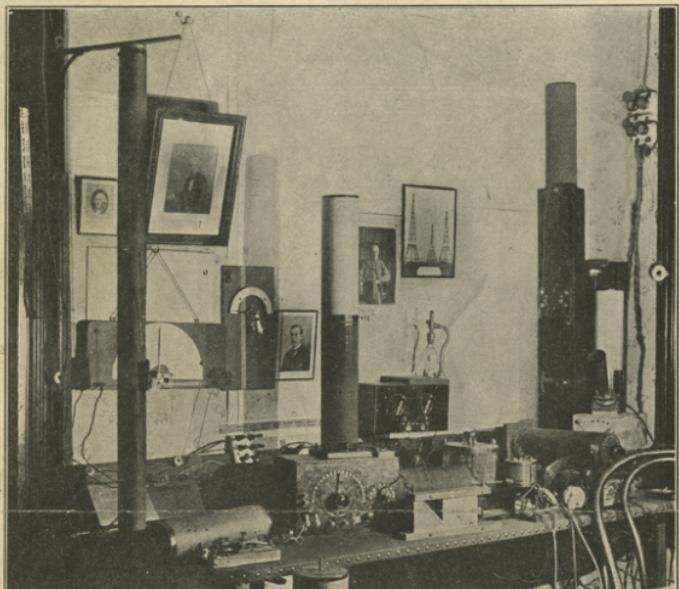
Once the full extent of the Sayville wireless spy ring became clear, public attention inevitably returned to the sinking of the Lusitania at the beginning of that very summer, in May 1915. Speculations and conspiracy theories abounded on Sayville's role in the sinking of the ship by a German U-Boat. Were the instructions to attack sent by Sayville? How could the government have allowed the Germans to triple the station's power in the very next month? According to several sources I've come across, Sayville was one of the relay points for the Zimmermann telegram that precipitated the US entry into the war, a year and a half *after* the government installed censors to oversee the activities of the Telefunken employees operating the plant.

Precisely how the Germans cryptographically hid their communications right under everyone's noses—and in turn, above their heads—remains a mystery.

Mr. Charles E.  
Apgar, Radio  
Investigator of  
Westfield, N. J.  
Who Recorded  
on Phonograph  
Cylinders All  
of "Sayville"  
Radio Messages  
for One Month.  
The Evidence  
Helped to Close  
the Station by  
Uncle Sam.



## Westfield, N. J., Radio Station



The wireless of Charles E. Apgar is interesting from several standpoints. It was this station which did the secret service work for the United States Government during the investigation of W.

S. L. During June, 1915, Mr. Apgar made phonographic records of all messages sent out from Sayville. The apparatus with which he did the work is shown in the photograph.

(Reprint from Q S T, December, 1916.)

Chas. E. Apgar.

Aug. 1942.

I published a short article on this story back in July, and about a month later, I received an email from Kristen Gallerneaux, Curator of Communication and IT at the Henry Ford Museum. Kristen told me that the Ford Museum had in its holdings a huge collection of equipment confiscated from the Telefunken stations at Sayville, another in Tuckerton, as well as several devices from Charles Apgar, including parts from the receiver he ostensibly used to record signals from Sayville.

One of the objects in this collection they have given the intriguing name “Mystery Object 40.9.11,” a light-tight wooden box containing a neon yellow, paper tape reel. When the Museum’s conservation department initially opened the box, the paper tape began fading to a near-white pale yellow, leading them to believe that the tape was treated with cyanide. Kristen’s first thought was the cyanotype process. But her search for evidence of cyanotype paper-tape devices in radio and wireless history came up with nothing.

I’ll quote from her email describing the next steps:

“The conservation department did a bunch of in-house tests with tiny pieces of the paper. They applied heat, light, acids, solvents, and even some kind of ‘smell test’ where they light the material on fire in a glass jar and then sniff the fumes to try and detect certain odors. None came up positive for cyanide. We sometimes work with the Detroit Institute of Art’s Conservation lab, where they have different equipment. They were able to determine that bromides were present in the paper. This made total sense, as silver bromide processes were another one of those alternative early photo processes that would have been in use in the 1900-1930 range.”

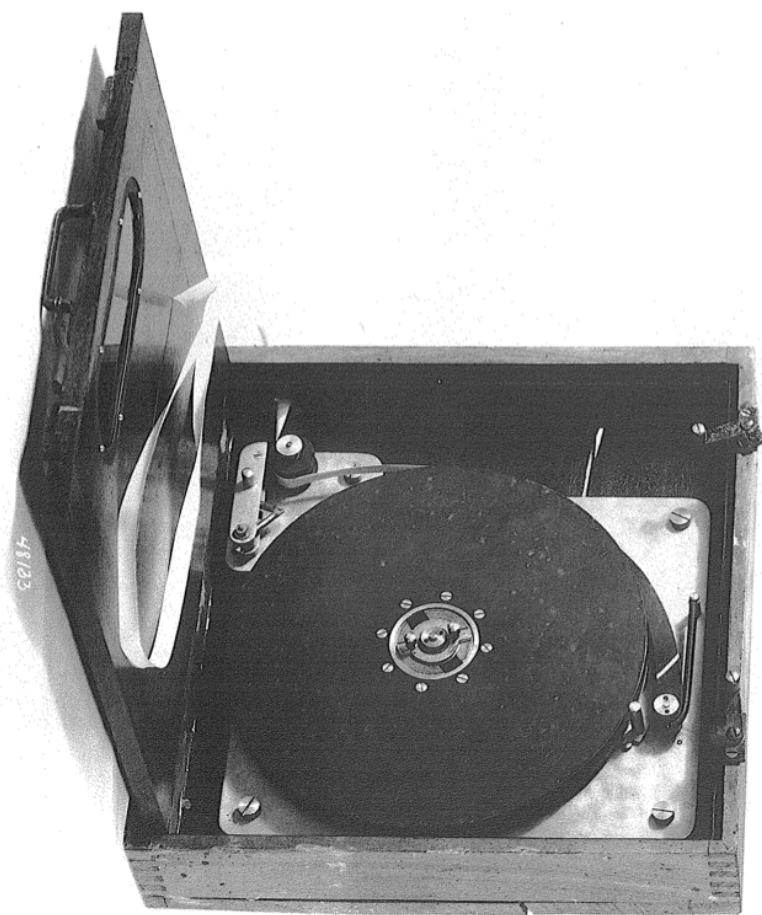
Here’s another view, a photograph of the object from when it originally came into the museum’s collections.

Kristen continues: “I did a little more research, and the lead of bromide solution on paper tape led me to conclude that the object is related to high-speed phototelegraphy—likely operating in conjunction with photoelectric cells and a ‘developer’ that came from the same accession. The box is light tight, painted black on the interior with red safety glass. I asked a retired electrical engineer if there were any minute mechanisms (electrostatic producing, etc) that I wasn’t seeing, and he said it was basically a ‘feeder box’ that would have led out to other components.

“We’re currently doing a few more tests on the organic materials present – rubber, wood, and Bakelite – to try and pin it down to a more exact timeframe. So, many overlapping museological forensic conundrums here, and I’ve had to embrace that [the] “Mystery Objects will continue to remain [a mystery] that much longer. For now, it is a wooden “black box” (literally and metaphorically) that held chemical recording tape, of potentials that never happened.”

Wireless telegraphy is topic I’ve been writing on for a while now, but I’ve yet to work directly with physical artifacts, let alone one whose function is completely unknown.





## Columbia University Society of Fellows

Spring 2014 Thursday Lecture Series

### Materiality

Unless otherwise noted, all talks begin at 12:15pm in the Second Floor Common Room, Heyman Center, East Campus

[www.columbia.edu/cu/societyoffellows](http://www.columbia.edu/cu/societyoffellows)

The grid consists of 11 individual lecture posters arranged in three rows. Each poster includes a small image, the date, the speaker's name, their title, and a brief description of the topic.

- February 13** **Robin Fleming**  
Professor of History, Boston College  
*Women, Material Culture and the History of Post-Roman Britain*
- February 20** **Eduardo Kohn**  
Assistant Professor of Anthropology, McGill University  
*How Forests Think*
- February 27** **Linford Fisher**  
Assistant Professor of History, Brown University  
*Decoding Roger Williams: Texts, Cryptography, and the Materiality of an Early American Mystery*
- March 6** **Nancy Langston**  
Professor of Environmental History, Michigan Tech  
*Hybrid Ecologies and the Environmental Humanities*
- March 13** **Bernhard Siegert**  
Gerd Bucerius Professor of History and Theory of Cultural Techniques, Bauhaus-University Weimar  
*When Materiality Intervenes: Towards a Trans-Disciplinary Epistemology of Disruption*
- March 14** **Eric Nelson**  
Professor of Government, Harvard University  
*Property without Appropriation*
- March 27** **Karen Barad**  
Professor of Feminist Studies, University of California, Santa Cruz  
*Time Diffractions, Virtuality, and Material Imaginings*
- April 3** **Mel Y. Chen**  
Associate Professor of Gender and Women's Studies, UC Berkeley  
*Material Alliances*
- April 10** **Mariska Leunissen**  
Associate Professor of Philosophy, UNC Chapel Hill  
*Teleology and Necessity in Aristotle's Account of the Natural and Moral Imperfections of Women*
- April 17** **Fredrik Albritton Jonsson**  
Assistant Professor of British History, University of Chicago  
*Victorian Anthropocene, 1834-1884*

In thinking about what that might look like, I've actually been coming back to last year's Spring lecture series on "materiality." For those of you who weren't able to attend, we had a wonderful series of talks, including Nancy Livingston on estrogenic chemicals, the medieval historian Robin Fleming on broaches and bioarchaeology, Fredrik Jonsson on environmental awareness and coal exhaustion in the Victorian period — all of which took the term "materiality" to mean the cultural lives of physical, tangible materials, rather than an abstract philosophical category. Tim Ingold has a very nice article called "Materials Against Materiality" where he critiques this latter approach.

I think one of the things we saw in our lecture series was not only how capacious what we were calling the "material turn" can be —across a wide variety of methods, objects, periods, disciplines—but also that there are a shared set of assumptions in these new approaches to materiality. As Frederic Jonsson nicely put it, for instance, the question of integrating cultural and material explanations of historical change is one of the most pressing methodological problems for the humanities today.

In my own field of media studies, the effects of the material turn have been kind of kaleidoscopic. Even though media studies is a discipline that thrives on aphorisms and decisive pronouncements regarding the primacy of the material — from Marshall McLuhan's "the medium is the message" to Friedrich Kittler's "media determine our situation," — we've never settled on what precisely our object of study is. Should a media theoretical account of radio analyze its unique narrative and cultural forms? Or on the other hand, should it focus on the specificity of the technological substrate that afford these cultural forms?

The "changing materialist content of materialism," as Raymond Williams puts it, has in media studies classically reflected a geographic divide. It used to be a safe bet to say that while German media studies emphasized the role of circuits, screens, and substrates—in other words the materiality of communication—Anglophone approaches were preoccupied with culture, aesthetics, and identity—the content delivered by those circuits.

A 2002 collection of "key terms" for media studies published in the UK, for instance, contains no mention whatsoever of "material" or "materiality" among its 212 entries. The closest we get is in the definition of "medium" as "simply any material through which something else may be transmitted." That "something else" is clearly the primary focus of the remainder of the collection, which includes entries on celebrity, metaphor, multiculturalism, genre, and symbol, for instance. Materiality in this account is simply a neutral carrier of culture.

But the situation is no longer so simple on the American scene, with emerging approaches like platform studies, media archaeology, software studies, and critical making all beginning to take up what was previously a Germanophone emphasis on the materiality of media.

Again, to use some keyword collections as a yardstick, Bill Brown's entry in the 2010 *Critical Terms for Media Studies* includes "multiple orders of materiality":

“a phenomenological account of the interface between user and technology, an archaeological account of the physical infrastructure of the medium, and a sociological account of the cultural and economic forces that continue to shape both the technology itself and our interactions with it.”

Anna Munster, in the *Johns Hopkins Guide to Digital Media* published earlier this year, shows how accounts of materiality are further complicated when the object in question is “digital.” She writes that in new approaches like software studies, attempts are being made to connect the digital to social relations and historical practices. This is from her entry: “Understanding the database, for example, as a *material* digital object, means accounting for not simply the way it organizes and stores data but how it *enacts* its mode of organizing multiply, the ways it transduces and interrelates its multiple, proliferating levels of hardware, software, data, and social practices.” So the idea here is that maybe, we can have a sort of hybrid analysis of the affordances of the material substrate as well as the cultural codes written upon it.

All of this is to say, there has been no consensus on “materiality” as a topic in media studies. So what I want to do here today—to narrow things down—is question the role of materiality as it has been deployed in a recent approach known as “media archaeology.”

Media archaeology is a field that largely takes its cue from a Foucauldian understanding of the term—archaeology as an analysis of the conditions under which a certain object, statement, or discourse becomes possible or sayable in a precise historical moment. An archaeology of Natural History, for instance, would analyze the “governing statements” of that discourse, as Foucault puts it in his *Archaeology of Knowledge*: “those that concern the definition of observable structures and the field of possible objects, those that prescribe the forms of description and the perceptual codes that it can use, those that reveal the most general possibilities of characterization, and thus open up a whole domain of concepts to be constructed.”

The media theoretical adaptation of this Foucauldian concept is twofold: first, that discernible objects and perceptual codes are themselves the product of media technologies and instruments. And second, that the histories of these technologies must take into account all of the curiosities and forgotten paths not taken: quirky or fantastic inventions that never quite made it to the mainstream — punch cards, stereoscopes, magic lanterns, and the like. (The wireless “mystery object” is prime territory for a media archaeological approach.)

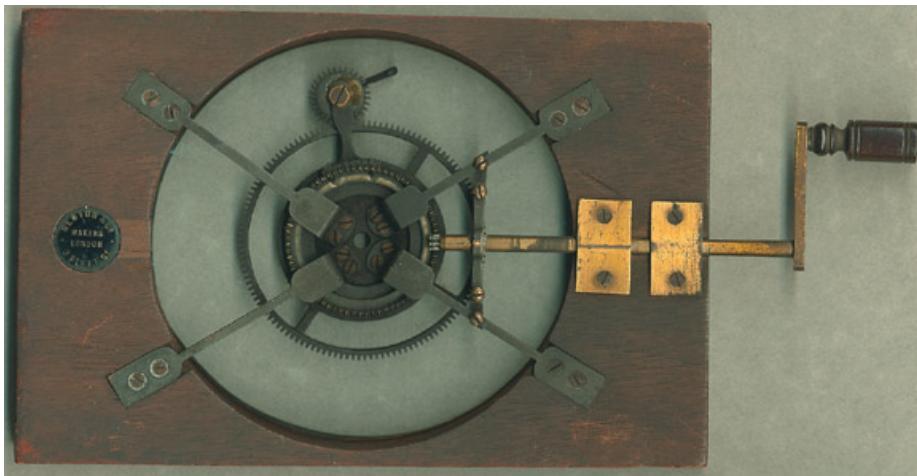
This plays out in a few different ways. First, some of media archaeology takes its inspiration from a pop cultural “spirit” of thinking the old and new along parallel lines — this includes DIY and maker movements sprouting up all over the place, interested in using retro media to build new devices from scratch.

There’s also steampunk — which is both a subgenre of science fiction set in the Victorian period, but also includes fan groups and conventions where people

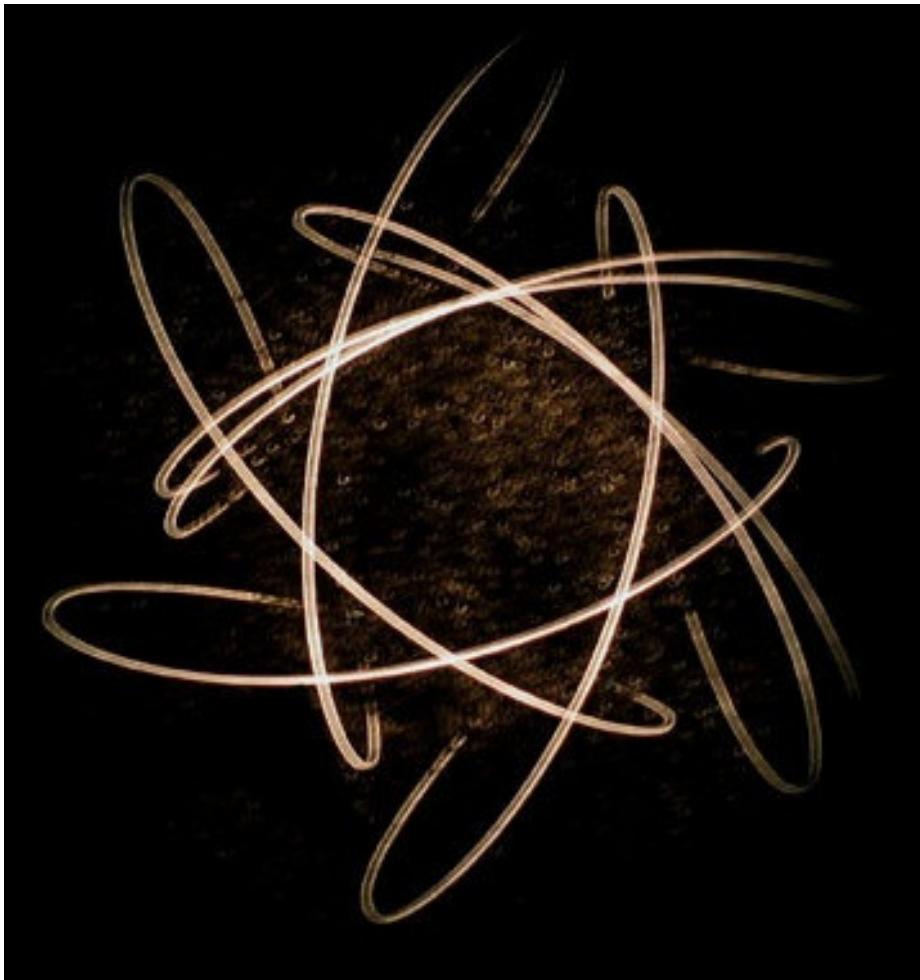


fashion elaborate costumes and accessories. So “thinking media archaeologically” has brought interesting mash-ups of history and the present, theory and practice.

In the academic realm, media archaeology is about uncovering new objects and thus stories that haven’t been told in the history of media. So, for instance, one wing of the field is focused on the media archaeology of...



- cinema – its deep history in optical toys, scientific instruments, and devices of wonder
  - cycloidotrope, 1860s



- object orientation – the way that bundling code or commands into “objects” or grammatical units allows one to think at higher levels, and the way this structures how we approach computers as a “medium”
- insects – how models of insect bodies and behavior, swarming, have influenced the design and cultural imaginary of media technologies

Part of the field is the simple challenge, common to all good theory, to think the present state of things differently, through these forgotten paths not taken. What if the computer didn’t look like what it does now? What if the metaphors we use to understand hidden computational operations — like copying a file, visiting a site — were fundamentally different? How do we go about imagining that?

But for me there’s often this kind of hand-waving that happens whenever a kind of Foucauldian analysis is applied to the black boxes that these critics open up — the critic points toward a circuit diagram and says, look, there’s discourse — without an attention to how things move in the first place from technology to culture and vice versa.

It was partly for this reason that I turned to archaeology proper, not only as an experiment in taking “media archaeology” at its word, but because of the untapped decades of research and debates on interpreting the material record. In their edited collection that officially christened media archaeology as a thing, Jussi Parikka and Erkki Huhtamo pretty definitively close off this possibility:

“Media archaeology should not be confused with archaeology as a discipline. When media archaeologists claim that they are “excavating” media-cultural phenomena, the word should be understood in a [very] specific way.”

But the history of archaeological thought is an immensely valuable, untapped resource for some of our current questions, enthusiasms, and impasses. It contains a huge literature on the interpretation of artifacts, which is precisely what humanists—who are largely trained in the analysis of text—are grappling with now as we begin to take up new kinds of objects of study.

What follows is an account of a particularly famous debate in the field, and a first attempt at applying its methodological insights to the way we talk about media today. (I will return to the mystery of Sayville...)

Illustrated here are two groups of stone tools manufactured by a Neanderthal culture known as the Mousterian, estimated to be anywhere between thirty and three-hundred thousand years old. The group of tools on the left includes heart-shaped handaxes, knife edges with smoothed hand holds, a number of small borers made of flint, and ridge-faced scrapers described as “denticulate” for their tooth-like structure.

On the right, we have a greater number of side-scrapers with a single working edge, a more uniform style of retouching that resembles overlapping fish scales, and a painstakingly formed blade usually associated with the later industries

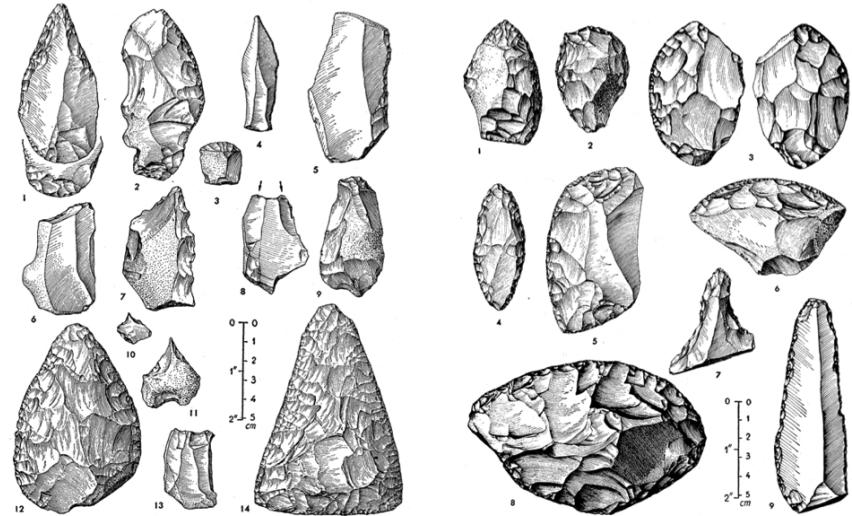


Fig. 1. Mousterian of Acheulean tradition: 1, point; 2, side scraper; 3, end scraper; 5, backed knife; 7, denticulate tool; 10, 11, borer; 12, cordiform hand axe; 14, triangular hand axe. Evolved Mousterian of Acheulean tradition: 4, backed knife; 6, truncated flake; 8, double burin; 9, end scraper; 13, bladelet core.

Fig. 3. Quina-type Mousterian: 1, side scraper, Quina-type; 2, end scraper; 3, bifacial scraper; 4, "linace"; 5, side scraper; 6, transverse scraper, Quina type; 7, nosed end and scraper (Aurignacian type); 8, transverse scraper, Quina type; 9, retouched blade (Aurignacian type).

of anatomically modern humans. These tools, all of which were excavated from the same site in the southwest of France—Le Moustier, hence the name Mousterian—occasioned one of the most famous debates over the study of culture through the archaeological record. At a time before the development and influence of chronometric techniques like radiocarbon dating that would allow later paleoarchaeologists to definitively order these artifacts in time and space, the Mousterian debate centered on the question of how we can extrapolate history solely from the formal properties of a technical object.

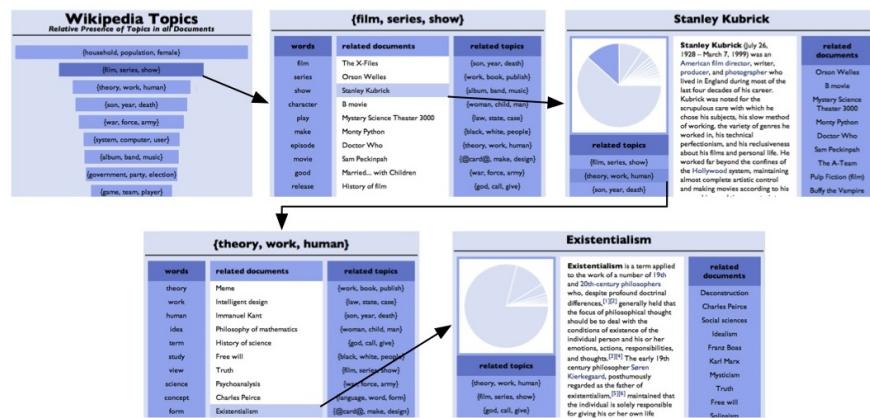
So basically the question is this: imagine a dig site in which you find all of the above “lithic,” or stone artifacts. In fact, many different tool types were often found in close proximity to one another. How do you tell which were the oldest? or, if the same individual was using multiple tool types? or, even if some of the artifacts were imported by groups from completely different regions?

This particular grouping of tools into two distinct types is the product of the French archaeologist François Bordes, who was the first to provide an overarching taxonomy for the wide variety of artifacts found at the site. Bordes grew up in the region and acquired an early interest for prehistory, participating in his first excavation at the age of 15. The first major publication on his findings on the Mousterian came in the journal *L'Anthropologie* in 1950, and by 1961 Anglophone archaeologists were introduced to the approach with a report in the journal *Science*.

In these articles, Bordes outlines a method that takes formal differences in lithic artifacts to be evidence of distinct cultures that held shared traits. In classifying groups of tools with shared morphological characteristics (the above representing only two of the four groups in his taxonomy), he argued that archaeologists could identify unique populations that existed at different moments in time.

Bordes was in fact employing a technique known as seriation that was first developed by the Swedish archaeologist Oscar Montelius, and later refined by people like Augustus Pitt-Rivers and Grahame Clark.

From the 1860s through his death in 1921, Montelius developed one of the first comprehensively geographical and historical typologies of prehistoric artifacts, a project that was made possible in part by the rise of railway networks across Europe, which made travel easier, and thus an increasing number of comparative digs. Montelius was inspired by the methods of his teacher, a numismatist interested in finding clearly defined types of coins. Out of individual artifacts, Montelius abstracted “types” based on “variations in form and decoration.” These types allowed him to look for co-occurrence, cataloguing which types of artifacts were usually found together, and which types were never found together. It was his hope that these clusters of association could signify subdivisions of larger units like the Bronze Age. Through a long process of relative dating (for instance, perhaps artifact type A was regularly found much deeper in the ground than artifact type B), Montelius formed timelines that gradually produced a portrait of how ceremonial, decorative, and technical objects developed throughout European prehistory.



For those of you familiar with topic modeling, you can basically think of seriation as topic modeling for time rather than semantics, using artifacts rather than words. In the data sciences, topic modeling is a form of machine learning that simply identifies words that appear together most often in a given corpus, statistically speaking. Here's one of Wikipedia — feed an undifferentiated mass of text (referred to as a “bag of words”) through a topic modeling algorithm,

and on the other side you get that entire corpus organized according to semantic units. In seriation, we're looking to produce distinct units of *time* out of an otherwise undifferentiated assemblage of artifacts. We end up with regional chronologies painted with very large brushstrokes.

Montelius's ideas gained enough currency that he was parodied by August Strindberg in the story "The Island of Paradise" (1882), in which an academic writes a dissertation titled 'The Necessity of Collecting Buttons from a Scientific Viewpoint.' This thinly-veiled stand-in for Montelius classifies buttons with holes as "buttons with one hole," and "buttons with two holes." From there, of course, we have buttons without holes, buttons without two holes. And so on. After the success of his dissertation this graduate student was immediately appointed Professor of Buttonology. Which is a footnote I love...

Fast forward 50 years to Bordes and the Mousterian industry. Bordes's particular contribution was to separate and formalize the means by which individual artifacts were defined as types, and the means of grouping those types into larger "assemblages." So, in this two-stage process, Bordes initially identified 63 types of stone tools, and then organized those types into four overarching assemblages. These assemblages were extrapolated from the relative percentage of tool types found at any given site.

So while Montelius used clusters of co-occurrence, Bordes hunted for percentages of tool types that could serve as the signature for a particular group or culture. Typical Mousterian, for instance, had a low percentage of transverse side-scrappers and an almost total absence of handaxes, while Mousterian of Acheulean tradition had a high number of heart-shaped (cordiform) handaxes, as opposed to "true" handaxes.

The idea was to provide a means of removing subjective judgments on the style of artifacts. But Bordes's taxonomy was in fact, very much dependent on his own, idiosyncratic decisions. As Melissa Wargo puts it, "In reality ... Bordes' approach was not merely a simple quantitative scheme. He routinely used qualitative criteria to refine his taxonomy." Mousterian of Acheulean tradition, for instance, was defined purely in terms of that distinctive hand axe, ignoring any of the other 62 artifact types as being significant.

In addition, it took Bordes a while to settle on precisely what these "assemblages" signified. In his earlier publications, he waffled over the best way to describe the groups of people associated with each technology. He began by using "traditions," moved to "tribes" by the early 1960s, and finally settled on "cultures" and "cultural groups." That Bordes never saw it as a problem to substitute the phrase "cultural groups" for taxonomic categories that were, in fact, entirely of his own making, was not lost on later figures in this debate. Wargo describes this as "the assumption by Bordes that the Mousterian facies [or stone forms] he identified in his taxonomy were reflective of some tangible prehistoric reality and that those facies had some inherent cultural meaning in the past." (82)

It seems as if for Bordes, to look at tools is to look directly at the people who

used them. And in reaching back across such a vast historical distance using artifacts so readily available, so tangible in the present day, one can't help but make huge speculative leaps.

In fact, Francois Bordes moonlit as Francis Carsac, his pen name as a science fiction writer. Carsac is actually one of the most critically respected French science fiction authors of the postwar era, and many of his novels and stories are set in the paleolithic period.

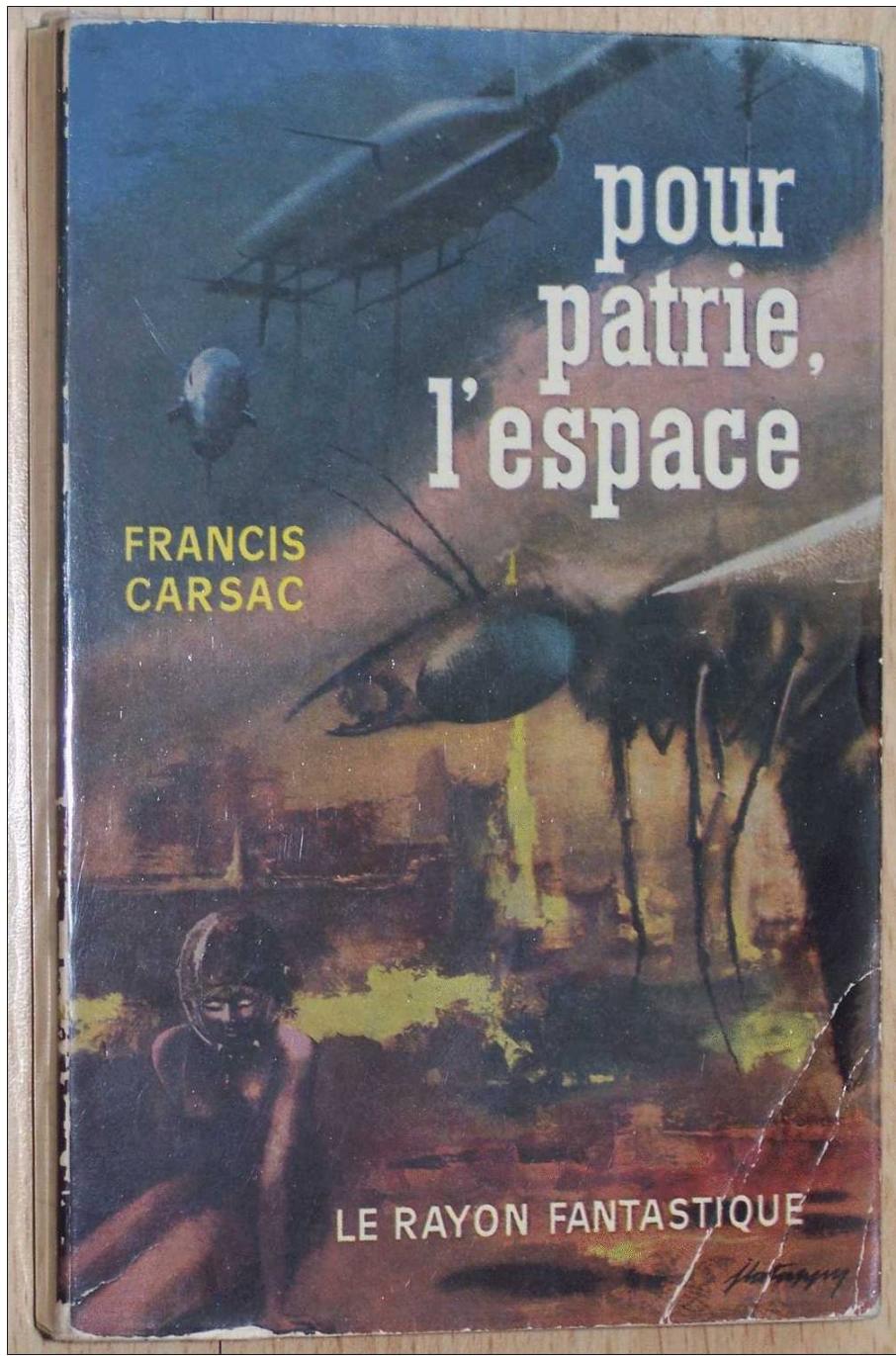
But it wasn't just Bordes's more creative visions that had a lasting impact. In what has been called his "phylogenetic interpretation" of artifacts, technology provides evidence of the cognitive evolution of hominid species, setting up a target to be reckoned with for later generations of archaeologists. Bordes's approach was revolutionary, as it was one of the first that rejected teleological models of evolution moving from the simple to the complex. His taxonomy of the Mousterian industry showed that there was no definitive "progress" from one group of tools — and thus cultural groups — to the other, with some complex artifacts preceding cultures that manufactured simpler stone tools. At the same time, Bordes's direct mapping of technological evolution onto biological evolution unseated the importance of anatomically modern humans and their emergence in the archaeological record by showing the great diversity and complexity of Neanderthal cultures, a species whose cognitive capacities were previously thought to be relatively elementary.

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For the younger American archaeologist Lewis Binford, Bordes's phylogenetic approach took far too many liberties in extrapolating definitive cultural characteristics just from the morphology of artifacts. Instead, Binford encouraged a far more pragmatic approach, one focused on the functions that each of these tools might have served. Binford's interpretation was based on a processual understanding of culture: an unfolding negotiation of groups, artifacts, and environments rather than "a static set of shared traits."

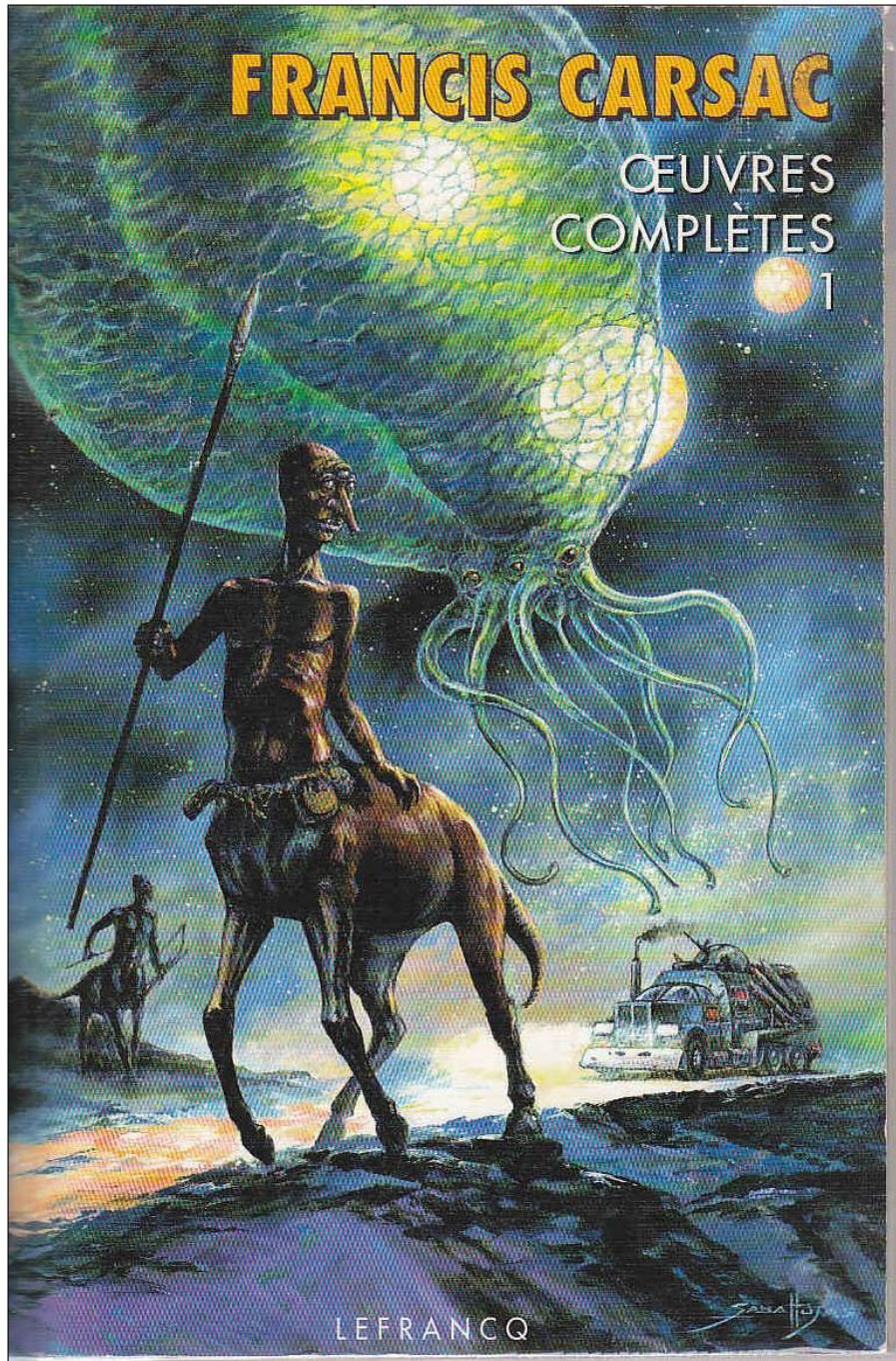
Binford's work was at the forefront of a movement in the U.S. known as the New Archaeology or processualism, which took an anthropological approach to the material record, as opposed to a historical approach. As they saw it, archaeology didn't need more data, it needed interpretation. In Binford's words, the question was "not how to look but how to think." The result of this movement was that archaeology transitioned from a descriptive to an explanatory science. Binford in particular favored "testable hypotheses about social organization" (B&B 1966, 293) over descriptive cultural histories, which is how he saw Bordes's work. The Mousterian tools thus served as the perfect case study to launch this new perspective on archaeology.

The careers of these two archaeologists overlapped in many interesting ways. In the same year that Bordes published his definitive article in *Science*, one that would have such a big impact in the U.S., Binford began his career in earnest, publishing his first academic paper. Binford started out as New World



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archaeologist, studying Native American interactions with the first colonists in Virginia, and only switched to the study of the paleolithic under the influence of his wife Sally, coauthor of many of his papers throughout the 60s, and a professor at Northwestern University in paleolithic archaeology. Sally Binford is almost never mentioned in the histories of archaeological thought I've consulted, and again this is only a kind of footnote, but there's an amazing oral history of the SF Bay Area in the 60s and 70s that includes an interview with Sally in which she provides a window on working with Lewis at this time:

"He was an extremely brilliant guy, but couldn't write a sentence that made sense... My job in the marriage became to translate what Lew wrote into English and to get him his Ph.D."

"I served another trickier function: one of Lew's fatal flaws is that he's a pathological liar—and most of the time he didn't know he was doing it. He is truly incapable of distinguishing what he wants to believe from what is real. He had a distressing tendency to "improve" data. He would generate a large number of original and intriguing ideas—90% of which bore little or no relationship to reality. But the 10% that were valid were great. I would attempt to steer him away from his more imaginative notions and help him in finding data to support the sounder ones, then help him write them up in comprehensible English."

Suffice it to say that their marriage doesn't last long, and Sally leaves the academy, horrified by its sexism and racism, joins the Sandstone Retreat and its experiments in group marriage, befriends Daniel Ellsberg who leaked the Pentagon Papers, becomes one of the leading figures of the sexual revolution in southern California — she's one of the most interesting people I've read about in a while. Worth looking into...

Ok. So it's some time in the early 60s that Sally introduces Lewis to the work of Francois Bordes and the Mousterian assemblages. Sally had previously worked with Bordes on excavations in France during her graduate work. Around 1965, the Binfords begin doing some "computer-aided statistics on Bordes's original tabulations," and perform a comparative study with Mousterian tools found in Syria. They publish the result of their research in a massive 1966 article in *American Anthropologist*, outlining their methodology.

While Bordes used simple frequency counts to produce his four assemblages, Binford and Binford employed advanced statistical methods—namely, factor analysis—to reconstruct potential patterns of tool use. Much of the article goes a little farther into statistics than I'm able to follow comfortably, but the idea is that if we accept Bordes's original view of the Mousterian, they write, "one must [then] envision a perpetual movement of culturally distinct peoples, never reacting to or coping with their neighbors. Nor do they exhibit the typically human characteristics of mutual influence and borrowing. Such a situation is totally foreign, in terms of our knowledge of *sapiens* behavior." (240)

The outcome of the Binfords' analysis allowed them to break the Mousterian assemblages down into subunits of artifacts they referred to as tool-kits for the

performance of specific sets of tasks. (289) There were five different categories:

- Activities carried out around the home-based manufacturing of secondary tools and hide finishing (borers, becs, end scrapers, burins, and naturally backed knives);
- Hunting and butchering tools (points and side scrapers of all types);
- Food preparation (backed knives, naturally backed knives, end notched pieces, typical and atypical Levallois flakes and retouched blades);
- Processing of plant material (denticulates and notched tools, scrapers with abrupt retouch, raclettes, truncated flakes); and
- Specialized hunting and butchering (elongated Mousterian points, discs, scrapers on the ventral surface, typical burins and unretouched blades).<sup>1</sup>

The argument was that cultures are not internally homogenous. Individuals have “functionally interrelated roles.” Bordes, as you can imagine, fundamentally disagreed with this interpretation...



... asking his illustrator Pierre Laurent to draw this cartoon as a gift for Lewis, of different caves for different tasks: “I’m sorry my love, there’s no way to scrape your skin. There’s a *living* skin in the skin-scraping cave.” The scene includes separate caves for cooking, making tools, even for doing statistics.

But Binford’s argument was fundamentally about the theory of “culture,” one that was designed to move archaeology as a discipline from the periphery of

anthropology to its center. In an article published a few years earlier by Lewis Binford alone, titled “Archaeology as Anthropology,” one that first made his reputation in the field, he critiques the up until then standard approach of interpreting the material record:

[binford quote]

“Archaeologists tacitly assume that artifacts, regardless of their functional context, can be treated as equal and comparable ‘traits.’ Once differences and similarities are ‘defined’ in terms of these equal and comparable ‘traits,’ interpretation proceeds within something of a theoretical vacuum that conceives of differences and similarities as the result of ‘blending,’ ‘directional influences,’ and ‘stimulation’ between and among ‘historical traditions’ defined largely on the basis of postulated local or regional continuity in the human populations. I suggest that this undifferentiated and unstructured view is inadequate, that artifacts having their primary functional contexts in different operational sub-systems of the total cultural system will exhibit differences and similarities differentially, in terms of the structure of the cultural system of which they were a part.” (217-18)

You can see what Sally was wading through as she rewrote his manuscripts...

In their Mousterian article, Sally and Lewis Binford defined culture as an “extrasomatic means of adaptation for the human organism.” This “functional interpretation” saw tools as adaptive markers that existed in complex relationships with new environmental demands and changes in social organization. Denticulate tools used for butchering animal carcasses or side scrapers for shredding plant materials might take on a different form when a population encountered a new species moving into their region. Similarly, if that group experienced an environmental change or migrated to a different terrain, they may have to fashion their tools out of very different raw materials. Thus in Binford’s functional interpretation, the types of histories one can infer from the archaeological record are manifold. And, cultural change is seen as a rational response to changing ecological conditions. Hominins are thus another predictable variable within an ecosystem.

Of course, any positivist method for formulating the laws of cultural dynamics is bound to encounter problems. Once again, subjective criteria entered into this new approach. For John Hayward, “Binford’s use of highly complex statistical analysis to find toolkits within lithic assemblages meant that they really only existed on paper, and consequently resulted in him never being able to offer any empirical evidence for their physical existence.” (cites Dibble 1991, 240) Later use-wear analyses on Mousterian assemblages even showed that the tool types as categorized by Binford had no relationship to their proposed use whatsoever.<sup>2</sup> Because Binford effectively said that Bordes’s classification system wasn’t flawed, but his interpretation was, his continued use of these 63 initially proposed tool types added a further layer of complication to Binford’s functional model, most importantly in that many of these forms have been found to be “the same tool in different stages of resharpening” rather than unique types.<sup>3</sup> Finally, Harold

Dibble and Shannon McPherron have recently argued that the small flakes struck off from the larger stone cores were in fact useful tools in their own right. “Middle Paleolithic hominins deliberately produced small flakes for specific functions. If this conclusion is true, then this fact has been overlooked for virtually the entire history of the discipline.”

Needless to say, far from being a story of linear progress in our understanding of Neanderthal cultures, the Mousterian debate goes on, with new approaches emerging all the time to Bordes’s cultural historical interpretation and Binford’s processualist understanding.

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For me, the Mousterian debate reveals the complexity of how we narrate the many lives of technology: the tasks to which our tools are put, the expanded ranges of action and forms of expression they enable, the cohesion and succession of sociocultural traditions, and how we resurrect such forms of subject-object interaction from history. Bordes provided a model by which we can begin to think about successive paradigms of techn-ology in its most literal sense—as a thinking on and through tools—while Binford’s approach showed that tool-use never happens in a vacuum, with a complex set of environmental factors determining how we perform any task — our technique.

The debate also provides a historicist reminder that everything we know about the past of tool use is based on extrapolation, especially when it comes to prehistory. Of course, these questions of interpretivism have since been simplified by chronometric techniques that lend greater accuracy to the dating of objects. Bordes and Binford wrote just before the development and influence of radiocarbon dating, which allowed later archaeologists to definitively date the order in which these tools were developed. So, unless they extracted paleolithic tools from neatly stratified layers in the sediment, thus lending some sort of temporal order (which was exceedingly rare), they strung artifacts together in a historical sequence by extrapolating out from form.

But to say that radiocarbon dating effectively solves the Mousterian debate by allowing the archaeologist to declare that, in fact, this side-scraper is exactly 43,000 years old, is to overlook the material vicissitudes of extracting a technical object from the sediment and abstracting it from all of its Heideggerian involvement-relationships. Herein lies the importance of understanding the technical object not just as a tool, but as a complex of traces revealing the preferences, routines, and styles that form the basis of individual and social behavior. In extracting and abstracting these artifacts, we experience what German media theorist Wolfgang Ernst describes as “the hard-edged resistance of material objects that undo historical distance simply by being present.” No matter how finely tuned the scientific instrument, the accuracy of archaeological evidence is always inflected by “the human eye, confronted with an irritating material presence of the past, which by definition should be absent, [a situation

that] immediately confounds evidence with magic.”<sup>1</sup>

Magic, when it is spoken of in relation to technology, usually implies a kind of awe in the face of inscrutable complexity. According to Arthur C. Clarke’s so-called third law, “any sufficiently advanced technology is indistinguishable from magic.” But it is important for us to remember that there is a very different form of magic about tools as simple as the denticulate side-scraper, one that has everything to do with legibility. These artifacts compel speculation on the irremediable texture of habits and techniques that have long since been forgotten or absorbed into other forms of technical expertise. Despite their alien appearance and their improbable survival from a world so different from our own, these tools (like any other) almost seem to reach out and grasp us, whispering of how they are to be used. This is what we might call technology’s ontological magic: how we come to understand what a tool is and what it’s good for.

Prehistoric stone tools, dead media, and shiny new devices feel like magic because they exceed the contextual frameworks within which we would normally use them while at the same time providing a material trace of what the contours of that use might look like.

While the Mousterian debate reveals what’s at stake when thinking about technology, I want to suggest that it also dramatizes what it is to think through technology. There is something of this paleoarchaeological magic evoked every single time we pick up a tool. A delimited set of affordances branches off from the contours of the individual tool (e.g. torque, storage, amplification), but it is never enough to simply begin and end here. This functionalist model must always unfold into a range of preferences, routines, traditions, and styles. Thus, the dialectic at the core of the still unresolved Mousterian debate – between cultural tradition or functional adaptation, technology or technique – is played out in the ways we think through a problem using the potential grammar of material solutions, whenever we decide to push or pull, attempt to decipher a manual, or prepare to teach a new method.

The “operational sequence” of any technical interaction, as the French archaeologist Andre Leroi-Gourhan calls it, consists in an assemblage of material and non-material components:

# gourhan quote

“Techniques involve both gestures and tools, sequentially organized by means of a ‘syntax’ that imparts both fixity and flexibility to the series of operations involved. This operating syntax is suggested by the memory and comes into being as a product of the brain and the physical environment.”<sup>2</sup>

In this sense, the precise contours of technical interaction have the potential to be wholly unique every time, with each instantiation of a particular technology or technique being subject to an alchemical mixture of cultural determinants

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<sup>1</sup>@ernst2011, p. 249

<sup>2</sup>@leroi-gourhan1993, p. 114

and individual predispositions. The tool cannot simply be reduced to the culture from which it emerged, nor can it be understood solely through the logic of functionality. Between the technology and the technique, there is a unique “syntax” negotiated by each of us, drawing upon the capacity to read the range of practical use off the shape of a tool, to imagine a series of possible or desirable outcomes, and to make those intangibles material.

And here’s where I want to take a very sharp turn back to our media historical “mystery object.”

If we continue in this vein, perhaps following Heidegger’s insight that “the essence of technology is by no means anything technological,” the question of what constitutes our object of study remains an open one. Does a handaxe crafted from a previously prepared stone core constitute a technology or a technique? What about a telegraph key designed to be grasped in the palm, its sounder struck with the thumb? Or a touchscreen that allows a pinching gesture to be translated into a change in the size of a digital image?

In the case of the mystery object, questions of technique may in fact be purposefully hidden from view. If you’ll recall, German operators were somehow able to send encrypted messages from the Sayville wireless plant even under the direct supervision of US government censors. What the government overlooked was that the fact that covert messages could be hidden not within the content of a given message, but rather within the signaling itself. Again, details on how this was accomplished are scanty, but several ideas were floated in the pages of *Electrical Experimenter* magazine.

In one proposal, hidden instructions were interspersed within regular, ordinary-looking messages by slightly lengthening the spaces between dots and dashes (see No. 1 Coded). The perfectly uninterrupted, strong signals made possible by the increase in the station’s power meant that gaps in a message could actually mean something rather than being a product of noise or static.

Another proposed scheme involved adding additional dots to the end of normal Morse characters, as in “No. 2 Coded,” above. The June 1915 expansions to the station also included a new lettered keyboard that produced a perforated paper tape of transliterated Morse code messages ready to be fed into an automatic transmitter. Type in alphabetic letters just as you would on a QWERTY keyboard, and out comes a ticker tape of machine-readable Morse code. Messages could now be sent at up to 150 words per minute, a speed that would have been impossible for any manual operator of a single Morse code key.

So, thanks to the plant’s novel keyboard-specific automation of Morse signaling, it’s possible that this overcoding could have been mechanized through what the *Electrical Experimenter* called “a small attachment of an electrical nature, perhaps, which could be fitted secretly to one of the automatic paper tape perforators or to one of the magnetic key transmitting mechanisms.” With reports of this automated transcoding mechanism tucked within the Sayville sending apparatus, it’s possible that even a US government employee could type





The Above "Code" Diagram Shows How Secret Cipher Messages Could be Interspersed Through Regular Messages.

out a message that contained hidden instructions to German U-Boats without even realizing it.

This also means that an automated sender would not only plant hidden messages within wireless signals, it would completely anonymize them. Ever since the invention of the telegraph in the early nineteenth century, the cadence or rhythm characteristic of an individual telegraph operator's sending touch was known as their "fist." The later term "ham radio" is a derivation, referring to the awkward keystrokes of ham-fisted amateurs. Operators were identifiable by their fist, and cryptanalysts used these unique rhythms to track patterns in the location of messages and their messengers. A paper tape feeder would have replaced the human operator with a uniform, mechanical rhythm.

Whether or not our "mystery object" is related to this automated signaling set up, I can't say. At the moment, this is all a matter of speculation between Kristen and me. Now, this doesn't necessarily mean that I want to take my place beside the conservators at the Ford Museum and help them perform use-wear analyses and spectroscopic tests on the mystery box.

But I do think that a rigorous engagement with debates from the history of archaeological thought allows us to apply a range of different lenses on our objects in media studies. And I've been trying to hunt down more instances of this:

Shannon Mattern, who teaches at The New School, has an ongoing project titled Urban Media Archaeology.<sup>4</sup> In a recent article on the thickly layered history of heat, water, and electrical infrastructures lying just beneath our feet, she writes, "there's much to be gained in a study of media-networked sites, like any city, by considering how archaeologists understand excavation – how they dig both metaphorically and literally into physical terrain – and by productively 'confusing' media archaeology and archaeology proper."

Colleen Morgan and Sara Perry, archaeologists at the University of York come at the same idea from the other side of the disciplinary divide. Last year, they performed what they called "an experiment in extending archaeological method into the systematised analysis of media objects," using stratigraphy as a kind of metaphor to describe the various layers of the file structure on an abandoned computer hard drive. This is an interesting project, even if it seems to be a kind of tongue-in-cheek provocation.<sup>5</sup>

One final example: Louisa Minkin and Ian Dawson are fine arts faculty in the UK who are spearheading a collaboration between the Archaeological Computing Research Group and the Winchester School of Art at the University of Southampton. One of their projects involves the application of digital 3D imaging to neolithic grave goods, using techniques like photogrammetry and texture mapping (which was developed by the video game industry to render 3D spaces. Interestingly, they ended up revealing details in the artifacts that subject experts of that period hadn't seen before.<sup>6</sup>

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While media studies has classically been interested in large scale materiality—with things like broadcast networks, representational frameworks, content delivery systems, power structures, transnational flows—several emergent approaches in media studies indicate a renewed attention to materiality as a process, negotiated on the smallest of scales.

But we need to be careful how we go about exploring this.

The paleoarchaeological idea that changes in technology can help us to register evolutionary shifts is one that has begun to enter popular consciousness, thanks to contemporary conversations on digital media. Gadgets like smartphones, tablets, and GPS receivers, say the pundits, are fundamentally altering the ways we read, communicate, and even think.

This shift has ramifications for **logic** (“Over the past few years I’ve had an uncomfortable sense that someone, or something, has been tinkering with my brain, remapping the neural circuitry, reprogramming the memory. My mind isn’t going—so far as I can tell—but it’s changing. I’m not thinking the way I used to think”), **memory** (“...it is an attribute of the Internet to activate in me, and maybe in all its users, a persistent sense of deferred expectancy, as if that thing that I might be looking for, that I couldn’t name but would know if I saw, were at every moment a finger tap away”), and even spatial reasoning (a recent editorial in *The New York Times* by the cognitive scientist Julia Frankenstein reports that the nature of spatial interactions – whether mediated through verbal directions, a map, or GPS technologies – physically alter brain structures). “**I miss my pre-internet brain,**” reads one piece of installation art by Douglas Coupland that has since gone viral as an Internet meme.

Further, several different approaches to questions of how technology evolves are now beginning to take off in media theory. After decades of denigrating the metanarratives of (among others) Marshall McLuhan, Lewis Mumford, and Vilem Flusser – theorists who sought to construct a deep history of technological paradigm shifts, each of which culminated in projected futures of what they called (respectively) the global village, neotechnic phase, or telematic society – models of evolutionary epistemology have begun to creep back into theories of media and technology. Excavational metaphors abound in digital media studies: media archaeology, data mining, the “forensic imagination,” and “visualizing the nineteenth century literary genome.” Man the Toolmaker, a notion prevalent among paleoarchaeologists in the mid-twentieth century that connected the emergence of the human with the beginnings of tool use, has taken on a new significance in the age of digital media and mobile computing.

As a means of assessing the changes wrought by new technologies, it has led to a resurgence in the concept of technogenesis among media theorists: the idea that hominids have co-evolved with tools in a highly complex feedback loop between the biological and the technical. For proponents of the theory of technogenesis, “it is impossible to define the human as either a biological entity (a body or species) or a philosophical state (a soul, mind, or consciousness), because our

‘nature’ is constituted by a relation to technological prostheses.”<sup>3</sup> As David Wills writes, “there is technology as soon as there are limbs, as soon as there is any articulation at all. As soon as there is articulation, the human has rounded the technological bend, the technological turn has occurred, and there is no more simple human. Which, for all intents and purposes, means that there was never any simple human.”<sup>4</sup>

While many proponents of technogenesis write on the scale of tens of millennia, others espouse the theory as a way to speak to the specificities of the digital. Some media theorists take the evolutionary model quite literally, as does Katherine Hayles when she writes of “the changes in human attitudes, assumptions, and cognitive modes associated with digital media.” But if the digital revolution not only recapitulates the evolution of technology but intensifies it, as Hayles would have it, the question becomes: is it possible for an individual to actually feel the pressure of evolutionary change? Can what previously occupied vast swaths of evolutionary time now be condensed into the life of an individual organism, or even further, a particular moment of technological interaction?

On one level, the answer is: certainly not. No one fully understands the mechanism behind the evolutionary divergence of modern humans from species who didn’t use tools, and any attempts to understand what the next great evolutionary leap may be (or has been) – such as Leroi-Gourhan’s amazing notes in 1962 on the rise of automation and “audiovisual media” – are speculative at best. Moreover, many media theorists writing on the idea of technogenesis in relation to contemporary media technologies employ ideas that are highly contentious and even completely outmoded among archaeologists today. For instance, many proceed from the starting point that it was the emergence of bipedalism that first allowed tool usage, citing a line of Darwin’s speculating that walking upright freed the hands to manipulate objects and carry food over long distances.

This idea is not only problematic because it is now generally accepted that our hominid ancestors were bipedal millions of years before they began making tools, but because tools have been observed in use with a wide variety of non-bipedal animal species, including chimpanzees, who have been shown by primatologist Andrew Whiten to possess “the capacity for cultural transmission.” That is, “experimentally introduced technologies will spread within different ape communities,” and individual chimpanzees show “a capacity to acquire local variants of the technique.” Research on the “cultures” of animal tool use significantly complicate claims that technology marks the distinctive specificity of the human.

And yet on another level, there is something to the idea that an encounter with a new technology causes an immediate reorientation in the ways we make sense of the world. The gadget-conscious of today frequently remark that touching the latest Apple product is like “holding the future in your hands,”

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<sup>3</sup>@bradley\_technicity\_2006, 78

<sup>4</sup>@wills\_dorsality:\_2008, 5-6.



as if the iPhone were the next iteration of the *2001: A Space Odyssey* monolith: a sleek black box we couldn't possibly understand but that somehow makes us smarter the instant we touch it. In this mythical explanation of human origins that falls into the gap of Kubrick's famous match cut from the bone club thrown into the air to the spaceship gracefully floating through outer space, we are simply remade by the tool the moment what might be done with it becomes clear.

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The turn I want to make here to archaeology proper is meant to emphasize that any approach to the historiography of media cannot merely devolve into a collection of forgotten curiosities and thus a better, more complete form of history. Archaeology gives itself over to inference, to potentialities not readily available on the surface by extrapolating history from typology, by “defining the position of each element in relation to the other elements in the series,” as Foucault puts it in one of his more materialist definitions of archaeology. Technical artifacts takes on a variety of forking paths, potential lives that branch off from the individual tool. Further, these tools are treated not merely as self-sufficient pieces of evidence, but as ideational units, imaginative products of the mind and culture that produced them. In this way, the idea is to explore not merely fictions about particular technologies, but the constitutive fictionality of technology itself – the way in which any technical interaction compels imaginative thought. Paleoarchaeology’s “epistemological reverse engineering” of human tool use mirrors the very process it seeks to uncover: we hold a tool and attempt to think through the contours of what it affords.

The Mousterian debate provides just one potential lens, but if I could step back a little more: I think that the far-reaching material turn across the humanities seems to present a unique opportunity for media studies in particular. If there is anything that unites the wildly diverse confederation of departments and disciplines loosely organized under the umbrella of “media studies,” it is McLuhan’s foundational aphorism: “the medium is the message.” Today, it’s as

if the fossil record of McLuhan's spadework can be found all over the humanities.

In reaching out to other disciplines that have a rigorous history of interpreting material culture, it's my hope that media studies can both identify its own unique forms of evidence and argumentation, as well as outline a methodology that may prove useful for other disciplines interested in the interaction between the material and the cultural.

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