



# *Where Have All Our Naps Gone? Or Nathaniel Kleitman, the Consolidation of Sleep, and the Historiography of Emergence*

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## ABSTRACT

*In this article, I focus on two moments of Nathaniel Kleitman's career, specifically that of his Mammoth Cave experiment in the 1930s and his consultation with the United States military in the 1940s–1950s. My interests in bringing these two moments of Kleitman's career together are to examine the role of nature and the social in his understanding of human sleep and the legacies these have engendered for sleep science and medicine in the present; more specifically, I am interested in Kleitman's disallowance of napping in his scientific protocols, which may seem incidental until one apprehends the lack of napping as therapeutic treatment in modern sleep medicine. By forwarding a conception of historiography building on Raymond Williams' "structures of feeling" and Gilles Deleuze and Felix Guattari's philosophy of immanence, I show how the work of William Dement in the 1970s to found a medicine of sleep and the eclipse of biphasic sleeping patterns as a biological and social possibility is indebted to Kleitman's scientific work. The modification of sleep is also the modification of society itself; and, as Kleitman argued, the harnessing of nature can lead to the finer entrenchments of human nature and society.*

KEYWORDS: sleep, alertness, biopolitics, governance, control societies



## SLEEP IN A VACUUM

In 1938, by descending into Mammoth Cave with a graduate student as a fellow test subject, Nathaniel Kleitman—professor of physiology at the University of Chicago—managed to interest the American public in the

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science of sleep and its potentials, a science that had laid in relative obscurity since the turn of the 19th century.<sup>1</sup> Kleitman's plan was to synchronize himself and graduate student Bruce H. Richardson to a six-day week—six days of 28 hours. They would remain in the cave for 32 days to explore the changes made in their circadian rhythms—a concept only then gaining some credence—primarily ascertained through variations in their body temperature. It was Kleitman's professed hope to conduct this experiment in relative quiet, but when the press discovered his scientific plans, the experiment became subject to national attention, and Kleitman took advantage of the momentary public interest in sleep to promote his work. The test, as recounted by Kleitman, was an ambiguous success at best: with only two test subjects, it would have been difficult to generalize the results of the test regardless of its outcome; in addition, of the two, only Richardson's circadian clock was able to be entrained to the new schedule, which might easily be attributed to the general sleep deficits of students rather than the flexibility of circadian rhythms. Kleitman, meanwhile, had great difficulty with the new schedule and was unable to fully acclimate to it; unwilling to nap, Kleitman found himself drowsy throughout the “day” and unable to sleep during the “nights” he had scheduled for the experiment. The goal of moving the experiment into the cave—as expressed by Kleitman—was specifically related to the environmental factors that control sleep, primarily daylight and noise; secondarily, moving into the cave meant extricating both Kleitman and Richardson from their social obligations. However, Kleitman's experiment did not entirely remove Richardson and himself from society and social interaction; instead, it substituted a less complex social structure on their lives for the period of the experiment, composed of the two experimental subjects and their interlocutors in the cave.

As described in a press release from the University of Chicago's Department of Press Relations on July 8, 1938 that immediately followed the return of Kleitman and Richardson to the surface world:

*Under the uniform conditions of temperature, illumination, and quiet of the cave, [Kleitman] and Mr. Richardson sought to adapt themselves to a 28-hour daily cycle, or a six-day week... Free from external influences such as sunlight, activity of others, and temperature changes, Dr. Kleitman and Mr. Richardson sought to change their habits while in Mammoth Cave to a twenty-eight hour day. Dr. Kleitman's temperature curve tended to remain that which prevailed during a normal twenty-four hour day, but Mr. Richardson's curve was readjusted to the longer cycle.*

The press release quoted Kleitman as saying “This experiment merely confirms previous results which I have obtained, in demonstrating that the [circadian] cycle is dependent on the activity of the individual. Some

individuals can change their cycle with considerable ease; others find a cyclical change difficult to establish.” However, it should be noted that Kleitman disallowed napping in both the Mammoth Cave experiment and previous experiments, despite what physiological cues test subjects might be experiencing; he was already convinced of a consolidated sleeping pattern for humans, and his experiments reified this expectation. This may seem only natural from the vantage of early 21st century society, which is based on eight hours of nightly consolidated sleep. However, at the turn of the 20th century, American sleep science was responding to a relatively recent transformation in industrial society, namely the consolidation of nightly sleep alongside the consolidation of the work and school day. Previously, Americans slept in less consolidated fashion, including regular daily naps and alternating periods of sleep and wakefulness during the night (Ekirch 2005). But with the consolidation of the industrial workday, sleep consolidated as well, giving birth to sleep medicine as physicians stepped in to tend to the need for nightly periods of rest that would obviate the need for daily naps. That Americans now seek out treatments for nightly insomnia is indebted to the structure of the American workday and the reification of particular models of sleep embraced by early 20th century sleep scientists. Although we might be tempted to think that the rise in popularity of sleep aides—such as Lunesta, Ambien, Rozerem, and Sonata, as well as Tylenol PM—is something that is new, close examination of the history of sleep science and medicine expose how this newness is rather an intensification of long held concerns and practices.

In this article, I focus on two moments of Kleitman’s career, specifically the Mammoth Cave experiment in the 1930s and his consultation with the U.S. military in the 1940s–1950s. I use these two examples of scientific experiments to think through a historiography of the emergent under the conditions of constant newness (Shaviro 2009; Whitehead 1985[1978]). If everything is always new, what are the implications for anthropologically informed historiography? How might we wrestle with the new in such a fashion as to expose its historical underbelly while maintaining attention to the conditions that are suddenly apparent to us as a distinct historical event in the present, particularly as an effect of ethnography? In pursuing this question, I bring together three quite different post-Marxist thinkers: Raymond Williams, Gilles Deleuze and Felix Guattari. I draw on Williams’ discussion of “structures of feeling” and “emergent” forms (Williams 1977) in parallel with Deleuze and Guattari’s discussion of “intensities” (Deleuze and Guattari 1983, [1972]; 1987, [1980]) to identify how that which is taken as new is tied in material ways to historical conditions and concerns, despite appearing to be autochthonous. Extending from Deleuze and Guattari, I argue that intensification builds upon the already existing, making what lay dormant into something

readily apparent and palpable. Whereas Williams discussion of “structures of feeling” tends toward the invisible, the impossible to grasp or isolate, what reading Williams through Deleuze and Guattari renders is a way to trace the emergent backward; the latter’s interest in “becoming,” those “molecular” and “molar” transformations of bodies, highlights their attention to “process”—that is, the constant unfolding of qualities that emerge as the byproduct of relations between actors and their environments. Structures of feeling might be seen through a similar lens: rather than inert formations that suddenly transform into emergent conditions, they are constantly in process, moving quickly or slowly to the position of dominance. The relative velocities of structures of feeling, the coming into being of hegemonic forms, is something that historiography is particularly able to grasp and expose. Comparing two phases of Kleitman’s experimentation with human sleep helps to elucidate both what is changing in Kleitman’s work as well as the possible powers of such a historiography of becoming. Kleitman helps to make modern American sleep, and it is through his intensification of consolidation—his eradication of napping—that he is able to do so.

The history of sleep science and medicine in the United States has been intimately tied to the science and medicine of alertness; that is, in the efforts to control the wakefulness of individuals, scientists have often acted upon sleep, its social scheduling, and its medication. Throughout the 20th century—and stretching into the 21st—experiments have been made of sleep, by scientists, clinicians, lay experts, athletes, and the military (Wolf-Meyer 2009). This interest in the modification and harnessing of sleep and wakefulness intensified projects that had been inaugurated in the 19th century with the expansion of the industrial workforce and the lengthening of the workday, which required the increased vigilance of workers as a result of a move toward consolidated sleep. As A. Roger Ekirch describes (2005), and others have supported, the move toward eight hours of consolidated sleep as a social and individual norm depended upon the widespread use of electric light (Schivelbusch 1995[1983]), the rise of urbanism, the move toward more anonymous forms of sociality (Elias 2000[1939]), and the use of daily stimulants, including caffeine and sugar. This use of tea, coffee, and sugar (Mintz 1985) on the factory floor aligns with Michel Foucault’s conception of disciplinary institutions (Foucault 1995[1975]), where individuals are brought into alignment with institutional expectations of behavior and biology. The expectation of consolidated, daily alertness conscripted individuals into a new temporal ordering of society, one which depended upon the coordination of bodies, institutions, and states on a massive scale for the production of goods and the movement of capital. In the 21st century, these disciplinary expectations have withered with the rise of expectations of self-management and control (Deleuze 1995[1990]), which have similar normative expectations but are

less predictable in the obligations to which individuals must come to fit themselves. This rise of control as related to sleep and alertness is due in no small part to Kleitman's ability to move sleep outside of the laboratory and clinic and into the everyday lives of Americans.

Kleitman does the following across these two experiments. First, he increases the scale of his object, moving from a simple, controlled experiment focused on two subjects to an experiment focused on hundreds. In so doing, he exponentially alters the scale of the social complexity in the experiment. The next scalar increase is to American society more generally, although this will come at the hands of his successors, who popularize a brand of sleep medicine based in Kleitman's assumptions about human sleep. Secondly, he concretizes his understanding of sleep as consolidated, that is, that it occurs in one long stretch of rest, whenever that may occur. He begins in Mammoth Cave with altering the length of the day but preserving periods of consolidated rest; he takes the same model to his work with the U.S. military, despite the protestations of the experimental subjects. This, again, extends to American society more generally in the formalization of sleep medicine in the 1970s and onward. Finally, and most profoundly, Kleitman's work instantiates a new model of nature in the form of consolidated periods of activity and rest that are based in science rather than conjecture; from this ontological foundation, pathologies of sleep are defined that provide the basis for conceptualizing human biology and its variations. While his and Richardson's experiences in Mammoth Cave are taken as idiosyncratic and benign, the coming of modern sleep medicine necessitated and depended upon conceiving of these variations as pathologies in need of medical intervention.

Taken together, these two moments of Kleitman's career help to expose the role of nature and the social in his understanding of human sleep and the legacies these conceptions have engendered for sleep science and medicine in the present; more specifically, I am interested in Kleitman's disallowance of napping in his scientific protocols, which may seem incidental until one apprehends the lack of napping as therapeutic treatment in modern sleep medicine. How are these moments and practices related? Kleitman, a professor of physiology and not a physician, helped to found the science and medicine of sleep in the 20th century, having trained both Eugene Aserinsky—who is usually attributed the discovery of rapid eye movement (REM) sleep (Aserinsky and Kleitman 1953)—and William Dement, one of the fathers of modern sleep medicine (see Dement and Vaughan 1999). In the conclusion of this article, I turn to the work of Dement and his efforts in the 1970s to found a medicine of sleep and the eclipse of biphasic sleeping patterns as a biological and social possibility. I follow recent interests in Actor-Network Theory (ANT) in focusing on conceptions of nature and the social

in the science of sleep to evidence the problematic understandings of human nature in the life sciences (Latour 2005), as both trapped in nature but also able to manipulate it toward social ends. The modification of sleep is also the modification of society itself; and, as Kleitman argued, the harnessing of nature can lead to the finer entrenchments of human nature and society. I first return to Kleitman's Mammoth Cave experiment and its assumptions, then turn to his consultations with the American military, and conclude by examining Dement's work.



#### MAKING SLEEP PUBLIC

The press release mentioned above closed with a contextualization of Kleitman's work as a scientist rather than a thrill seeker or showman: "The experiment, Dr. Kleitman pointed out, was no 'show of endurance, perseverance, or will power,' but simply part of a scientific day's work under *satisfactory experimental conditions*. Neither he nor Mr. Richardson suffered discomfort either during or after their stay in the cave" (emphasis added). We must accept that Kleitman's structure of the experiment—including frequent interruptions from the aboveground world—was intentional, or at least "satisfactory." Consider that Kleitman had prepared a list of "sleeping hours during which no visits should be made" Sunday 12 a.m. until 9 a.m., Monday 4 a.m. until 1 p.m., Tuesday 8 a.m. until 5 p.m., Wednesday 12 p.m. until 9 p.m., Thursday 4 p.m. until 1 a.m., and Friday 8 p.m. until 5 a.m. These blocks of time—nine hours for sleep, one-third of the 28-hour day's length, which upheld the then doxic rule that sleep should comprise one-third of a human day—did not allow uninterrupted periods of preparations for and recovery from sleep on either side of the rest period; to wit, meals were scheduled to immediately follow the sleep period, and if sleeping, Kleitman and Richardson were to be awoken by the arriving meal carrier. Among Kleitman's papers related to the Mammoth Cave experiment was a note to the director of Mammoth Cave National Park, informing him at what time meals should be delivered to the section of the cave that Kleitman and Richardson were inhabiting—safely off the main pathway tourists followed—and briefly described the kinds of meals that should be delivered (e.g., breakfast, lunch, dinner). In so doing, Kleitman imported a cultural pattern to his and Richardson's experience of the cave rather than allowing a rhythm to develop organically. In addition, "messenger service to [the] 'camp' twice daily" was planned in addition to the meal deliveries, the messenger bringing along "newspapers, etc." for Kleitman and Richardson. Thus, Kleitman retained social cues—emblemized in the kinds of meals asked for—and although he largely avoided social interactions, at least in the form of his work and family life, he maintained his relationship with Richardson,

which presumably had both sustaining and soporific effects, as well as with the various deliverers and correspondents.

In developing the Mammoth Cave experiment, Kleitman was not unfettered by institutional demands or expectations of “satisfactory” experimental design, and much attention needed to be paid to the procurement of the proper space to conduct the experiment, both secluded from society and properly purified, as well as the grooming of the space into a laboratory setting. In Kleitman’s research papers, he describes the experiment as follows:

*The purpose of the investigation is to elucidate the mechanism of diurnal alteration of sleep and wakefulness. Body temperature seems to follow the adaptation of the organism to daytime activity and night rest, as it shows its highest value in the afternoon and lowest in the early hours of the morning, with a diurnal range of 1–2°F. The diurnal body temperature curve is absent at birth, but becomes established as the child adapts itself to alternating activity and rest during each 24-hour cycle of day and night. It is known that the body temperature curve can be shifted any number of hours, as when a person moves from the United States to China, or it can be completely inverted as when a person regularly stays up at night and sleeps in the day-time [sic]. In either case, however, the duration of the cycle remains unchanged, namely, 24 hours. It is our purpose to find how easy or how difficult it is for a grown up individual to change his body temperature curve from a 24-hour to a 21-hour or 28-hour cycle.*

In response to Kleitman’s initial attempt to secure a space for the experiment at Mammoth Cave—which would importantly include access to electricity for the purpose of running the various machines required for the study—the general manager, W. W. Thompson, suggested that Kleitman consult representatives from the Delco Company or the Westinghouse Company, as they “would be very glad to loan one of their [portable generator] machines without charge” as it would be to their public benefit to be associated with the experiment. He went on to suggest that the University of Chicago’s “department of psychology would also be very interested in these experiments because I imagine that remaining in Mammoth Cave for several weeks would qualify an individual as being a real cave man,” a joke which seemingly unknowingly skirted the primordial object that Kleitman was hoping to elucidate in his experimentation—the fundamental biology of human sleep. Kleitman’s response, somewhat evasive, suggested that he was “anxious to avoid unnecessary publicity, at least, until we are through with our work in the cave,” a phrase loaded with tentative language and, one might assume, some eagerness to publicize positive results of the test once scientifically established.

Of special interest to Kleitman was the construction of the beds in which he and Richardson would sleep while in the cave, which needed to be proper spaces for the pursuit of science, a purification of social and environmental elements to yield scientific results. As such, they needed to balance two requirements: protection from the rats and other cave denizens who might climb their way into the beds, and being of sufficient height and size to accommodate the technology necessary to record the physiological events produced in the test subjects over the 28-hour schedule. H. S. Sanborn, the hotel manager at Mammoth Caves, described the beds as “iron frames to be 40 inches off the ground and the total height of the bottom of the bed springs to be 57 inches...We would then put a tin rat guard 36 inches above the ground around each of these pipe legs so that there would be no danger of rats jumping up.” What resulted was hardly a hermetic space for sleep but rather two odd, ramshackle beds, supported on wide pipes, and fitted with upside-down buckets to dissuade the larger cave dwellers of their desires to share the beds with their human inhabitants. As a space for the conduct of purified science, the beds were wanting. But, presumably, the beds were “satisfactory” enough for the experiment as conceived by Kleitman.

In his formal letters of thanks to the personnel at Mammoth Caves, Kleitman again stated the foundations and desires for the experiment, explaining that:

*Our stay in the Cave was no stunt, nor was it to be a show of endurance, perseverance, or willpower. We look upon it as part of our day's work, and we sincerely believed that we would be able to come, stay here, and leave unnoticed. Publicity may be welcome in Washington or Hollywood, but is definitely frowned upon among scientists. We were therefore quite distressed when the news of our being in the cave first leaked out, but now, after we got used to it, we are rather inclined to take it good naturedly. We are eager to return to the University of Chicago and to lapse again into our laboratory anonymity.*

The production of laboratory space in the cave—and the production of such “experimental” spaces more generally—was meant to allay two doubts: that of the self-serving pursuit (or the scientific “stunt,” as Kleitman phrased it) and that of the “unscientific” result, lacking proper testing through the scientific method. Having established these certainties, Kleitman eventually agreed to the filming of the Mammoth Cave experiments by *News of the Day*, who filmed newsreels for display in cinema theaters in the United States, although he only admitted the film crew to the cave once they had conducted the majority of the experiment. To allay Kleitman’s fears of being made into a spectacle rather than rigorous scientist, *News of the Day*

manager and cameraman Jack H. Leib wrote to Kleitman on July 1 to secure a time to film the cave's interior and Kleitman and Richardson in action; he insured Kleitman that "we will in no way ridicule the experiment in fact, I have a letter from my New York office guaranteeing this" and explained that he hoped "to record a short talk from you as to the purpose and the success of your experiment. You, of course, may say anything you wish." Leib then described the editorial desires: "Besides scenes showing yourself and your partner carrying on experiments on yourself we also wish to make scenes showing men bringing in food and supplies to you in order to show the men passing thru the various chambers and passages of the caves." Kleitman agreed to these plans and allowed the experiment to be filmed; despite the inconclusive results of the experiment, Kleitman accepted the publicity afforded to him. What this publicity might have established is that sleep never exists outside of social interactions and interruptions—the nature of sleep cannot be purified beyond these basic strictures of human life.

The space of the caves, as noted above—although removed from the social obligations and interactions that comprised Kleitman's and Richardson's everyday lives above ground—were riddled with social interactions and cues. In effect, Kleitman did not test human physiology in a vacuum—which might be considered as necessary to determine its primordial nature—and instead substituted one society for another. Kleitman could not acclimate to this new society, but Richardson easily shifted his physiology to align with the new social formation. As noted above, these results were taken to indicate the inability for human circadian rhythms to uniformly adjust to a 28-hour day and the need for consolidated sleep; all that was tested was Kleitman's and Richardson's circadian flexibility, but the results were taken to be generalizable to the human population, despite the low sample size and experimental conditions. What was operating between the space of Mammoth Cave and American society was a metonymic relationship. In other words, rather than science being removed from the larger American public, the Mammoth Cave experiment reenacted the American public. It reproduced the public and its dominant cultural expectations about science, and more importantly, about sleep, in the experiment. Consolidated sleep was taken into the cave, and it was returned to society in concretized form. What Kleitman succeeded in doing in the 1930s was insinuating, however briefly, sleep into the American public sphere and thereby reinforcing dominant expectations about the nature of sleep and its relationship to society. This led, among other things, to work on Kleitman's behalf with the American military throughout the years of World War II, and eventually, in the after war period of the 1950s, to the development of sleep as a subdiscipline of allopathic medicine. Throughout these transitions within the field—tacitly and expressly—contests of strength regarding the inevitable relationships of nature

and society were waged between medical professionals and their interlocutors. This had much to do with the cultural presuppositions Kleitman and his successors brought into—and continue to bring into—the practice of science and medicine as they worked to reify the dominant model of human sleep as necessarily consolidated as a physiological inevitability rather than culturally specific.



#### (CIRCADIAN) RHYTHMS OF WAR

In March of 1942, Nathaniel Kleitman prepared a report on “Suggestions for Improving Readiness for Combat and Increasing Efficiency of Performance” for the U.S. Army and Navy Fliers, the precursor to the Air Force. His suggestion was to have two shifts of sleepers, one who “would sleep between 5 a.m. and noon or 1 p.m. and the other half between 8 or 9 p.m. to 4 a.m.” Kleitman explained that “irrespective of the number and distribution of the watches or flights, the latter would always fall, day or night, during the regular waking hours of at least one-half of the fighting force” thereby preserving the reliability of something akin to normative everyday life, even during wartime. Kleitman went on to suggest three methods to determine how the armed forces should be temporally split, suggesting “preference,” “selection, on the basis of physiological tests,” and “by rotation—at equal and sufficiently long intervals, so that each group will become adapted to and maintain its own activity cycle.” Ultimately, he suggested that these three methods should be combined to offer the most fair and scientifically sound method for choosing which soldiers would be active at what times. The response given to Kleitman by the Surgeon General of the U.S. Navy, Ross McIntire, dated July 25, 1942, argued that the proposal was “wholly impractical.” McIntire went on to state that “Certainly its material value would have to be established most conclusively before it could be allowed to supersede routine which has been evolved through centuries of maritime warfare and proved by experience in all navies.” In July of 1942, Kleitman forwarded the same proposal to the Assistant Secretary of the Navy for Air, Artemus Gates, in the hope that the newness of the air force would circumvent the traditions that would otherwise stall the experimentation with Kleitman’s schedule in the other armed forces; Kleitman closed his overview of the schedule with the following appeal to military thinking: “A SLEEPY FIGHTER IS A MENACE TO HIMSELF AND HIS COMRADES, BUT NOT TO THE ENEMY.” Kleitman managed two critical moves in his appeals, whether they were fruitful at the time or not: he identified biological predispositions as underlying any scientific attempt to maximize the military control of sleep and the tactical advantage of a military who can manage their sleep and wakefulness.

Seemingly neglected by the military establishment, Kleitman addressed an appeal to Detlev Bronk, Coordinator of Research for the Air Surgeon's Office, arguing that "I seek no 'contracts' for research projects to be done in a laboratory. What I have to offer has been through the laboratory mill with success and is ready to be tested under field conditions, in training as well as in combat." Bronk's response, received by Kleitman in the winter of 1943, suggested that failure to adopt Kleitman's experimental schedule was due to factors relating to the training of new soldiers and pilots, and not the fault of perceived inadequacies in Kleitman's proposal. Bronk claimed that:

*During the training program, it is necessary to rotate duties in order that each trainee will have some night flying experience and, of course, all must have most of their training during the daytime...Certainly, it is true that many conditions other than physiological would determine the use that is made of a man and the time of day he is required to operate.*

Kleitman's eager reply argued that:

*[T]he Army and Navy do not hesitate to call for expert opinion on all sorts of subjects pertaining to the welfare and efficiency of their personnel. These subjects range from nutrition and sanitation to the design of helmets and breathing of oxygen. But matters pertaining to sleep and wakefulness, the latter even more important than the former, seems to be neglected, largely, in my opinion, because of the ignorance as to the existence of such a problem and the means available to solve it in a rational manner.*

He went on to argue that:

*When you discuss such subjects as fatigue, you will see fit to bring up the whole subject of the sleep-and-wakefulness cycle and to impress upon the powers that be the existence of such a problem, both in training and in combat. If they are convinced of the existence of such a problem, they may be open to suggestions for solving it.*

Despite his appeals, there is no evidence that they ever enacted Kleitman's experimental rearrangement of the social organization of the American military during World War II.

Based upon his experiences as an observer on the USS Dogfish in 1948, Kleitman was called upon by the U.S. Navy in the summer of 1949 to develop a new schedule for submarine crews. Crews had traditionally worked in "four on—eight off" schedules, meaning that they stood watch for four continuous hours then took an eight-hour break. They then returned to post

for another four hours before another eight-hour period of recreation. Because this schedule hewed closely to the eight-hour sleep requirement expected by officers and crew, it meant that the crew was often awakened prior to sufficient sleep being had; the result of this was that napping occurred throughout the other relaxation period, which Kleitman perceived as a problem. Kleitman's experimental schedule broke the crew into three sections, with each section working a total of eight hours per day, but in two three-hour periods and one two-hour period in an attempt to stave off potential boredom or fatigue while at post. Moreover, each section of the crew was also given a longer period of unbroken free time, ranging between 10 and 12 hours, which would ideally rotate among the various shifts. As Kleitman states in his proposal: "An unbroken stretch of free time...permits one to sleep 8 to 10 hours and still get up at least 1 1/2 hours before the beginning of the first watch period. Naps during the 2- and 3-hour intervals between watches are unnecessary. Though permitted, they should be discouraged." The reason naps should be discouraged was left vague. He went on to explain that "All meals served within 10 to 12 hours, as customary, but in the usual order of succession, breakfast always coming after the 'long' sleep... Breakfast served one hour before the beginning of the first watch, allowing a 'morning' waking-up period." Other meals also kept to cultural norms, with supper served three and a half hours before bedtime, allowing, tacitly, for a period of informal recreation after eating. Central to Kleitman's experiment were cultural expectations of what the everyday should be and the assumption that science was intended to preserve it—even when at sea and lacking the familiar cues and social obligations that were usually required to ensure that the organization of everyday life made sense.

The experiment was a disaster, partially due to the fact that the submarine crews only put the new schedule into effect for 11 days (July 18 through 29), as Kleitman notes in his letter regarding the findings, dated October 7, 1949. Kleitman suggested that in the future, if someone conducted such experiments, a "responsible investigator" should be aboard to control the experiment and ensure its success rather than allowing events to transpire that might derail proper scientific protocol. The summary of the surveys given to the crew aboard the USS Tusk prepared by R. K. R. Worthington (dated September 5, 1949) complained of the lack of space for the crew to inhabit during their recreation period—as some of the crew inhabited the bunk rooms, others were at stations, and the remainder were left adrift, "loafing around trying to keep out of the way." As a result, Worthington implied, the men stayed in the mess hall and ended up eating more than three meals per day, as "They were up and had little else to do." Eating extra meals might not normally be a problem, except at sea and under wartime conditions with limited rations—as a result, this was a significant setback. Worthington blamed

the cramped space of the submarine for the experiment's failure, citing "the operational and structural conditions imposed" as necessarily limiting the possibilities for spatiotemporal rearrangements of life under water. Naps, prior to Kleitman's best efforts, were substantial, with 91 of the 196 crewmen claiming to take naps of at least two hours per day; only 46 took less than an hour-long nap, and 59 crewmen took naps longer than two hours. During the experiment, 81 of the 173 surveyed crewmen claimed to take no naps; 64 crewmen took up to two naps daily, and 28 crewmen failed to answer the question. Only 33 crewmen claimed the new sleep pattern was "better," with 98 claiming it to be "poorer." A general lack of drowsiness was also reported, with 76 of the crew claiming to suffer "not at all" from it, with another 68 claiming that it still recurred "at times." In response to the question, "Conducive to greater alertness?" 117 crewmen replied in the negative, and 143 of the crew argued that the new schedule should not replace the traditional one. Despite Kleitman's best scientific efforts, the Navy crewmen were resolute in their not wanting the spatiotemporal regimes of normative everyday American life at sea. These experiments were conducted again in 1952 onboard the USS Scabbardfish, with 48% of the crew supporting the alteration to the experimental schedule. Despite this, the U.S. Navy preferred—it seems—a life of naps and nonnormative uses of time and rejected Kleitman's attempts to reorder life at sea yet again.

In 1955, by invitation, Kleitman participated in the Subcommittee on Field Sleeping as part of the Environmental Protection Division of the Quartermaster Research and Development Center. As evidenced by his papers, Kleitman served as a critic of the research conducted on the psychological, physiological, biophysical, and psychophysiological aspects of field sleeping. In his response to the various findings of the Subcommittee, dated April 22, 1955, which suggested that the "definition of sleep, the phenomenon we wish to measure" remained still obscure to scientific knowledge, Kleitman argued that "By comparison, one does not tackle a time-motion problem of the assembly line by first trying to find adequate definitions for 'time' and 'motion,' but rather by studying patterns of performance." He went on to argue that "the nature of sleep, fascinating and intriguing though it may be, is not a problem for the Quartermaster," but rather "to test the quality of the sleep by the subjective response of the sleeper and, even more important, by the performance of the subject during the waking hours that follow." He recommended that

*Critical performance tests should be made in the field, rather than in the laboratory, on service men, rather than on students or hired subjects, on performance on the shooting range, rather than in mental arithmetic, and in the middle of the day rather than immediately upon awakening*

*in the morning. All research projects proposed should be evaluated in the terms of promise to furnish an answer to the criteria of a “good night’s sleep.”*

What Kleitman was foundationally interested in, and what he attempted to steer the Subcommittee toward, was a strictly biological understanding of sleep and its effects, in as warlike conditions as could be manufactured—not in the laboratory per se, but under controlled conditions nonetheless. His interests were in a consolidated “good night’s sleep” rather than an unconsolidated sleeping schedule, as aboard submarines. It would be through the management of biology through social means rather than through pharmaceuticals or other technological means that this could be achieved, as Kleitman suggested in his critique:

*Attention should be called to the diurnal variation in efficiency of performance resulting from the acculturation of human beings to the daily schedule of family and community living. The daily rhythm, as revealed in the diurnal body temperature curve, can be either fortified, where activity is restricted to regular hours, or appropriately modified where the group performance is on a round the clock basis (as on ships, radar towers, hospitals, transportation, communication, sentry duty, etc.), with necessary adjustments in the hours of sleep.*

For Kleitman, something akin to normative everyday life was worth preserving under wartime conditions with its diurnal rhythms; despite this, his primary means of achieving the advantages he sought was through the management of daily spatiotemporal regimes. Only secondarily would biological factors be taken into account, in part, it might be imagined, because with the instruments of the time they would be largely subjective. Society makes sleep what it is; biology, and nature, is mutable. But within that presumed range of variations, Kleitman worked to preserve a consolidated “good night’s sleep” for American soldiers.



#### NAPPING TODAY, OR THE PROMISE OF CONSOLIDATED SLEEP

In this final section, I more closely examine sleep science and medicine at the turn of the 21st century and focus on the work of William Dement, who, since the 1970s, has labored to institutionalize sleep medicine in the United States. Along with Eugene Aserinsky and Nathaniel Kleitman, Dement was largely responsible for the discovery of REM sleep in the mid-1950s and the pursuit of its applications. However, not until the late 1960s with the noso-

logic descriptions of sleep apnea and narcolepsy did sleep medicine as a sub-discipline begin to congeal. Dement, as the primary steward of sleep medicine through this period, worked to develop a paradigmatic understanding of sleep as a natural inevitability<sup>2</sup>—albeit one that varied slightly between individuals—that could be controlled through the habitual practices of individuals. What Dement emblemizes is a form of medicine that acts as an intermediary between the biological demands of the individual and the expectations and obligations of society. Disorders of sleep, in this paradigm, are in need of alignment with these two forces—the social and the biological—although most often social obligations prove more persuasive, forcing the biological to be altered through medical treatment to meet society’s spatio-temporal demands. This persuasiveness is due to the ability of capitalist interests to make demands of individuals to meet social obligations, especially in the case of work, school, and family life; the temporal and spatial fixity of such social demands, paired with an understanding of human sleep as necessarily consolidated, provided 20th century sleep medicine with markers against which to measure individual sleep disorders while also providing concrete understandings of what “normal” sleep is. Dement perceives sleep as primarily a natural, inevitable force, indebted to the habits of individuals, but culturally flexible, as evidenced in cultures that practice midday naps (Dement and Vaughan 1999:81). These midday naps are taken by Dement as a variance from the norm of eight hours of consolidated sleep rather than as an alternate or more likely possibility for human sleep patterns; in other words, naps were understood by Dement as a culturally influenced choice rather than a biological necessity or desire, akin to Kleitman’s understanding of sleep aboard submarines. From this foundation, one might understand the need to nap during the day as produced by the *choice* to stay up late the night before, a choice facilitated by the advent of electric light and other technological distractions. Medicine is meant to intervene on behavioral choices as much as physiological states, and the panoply of decisions—including negative ones—increases with modernity.

Dement’s critique of contemporary American life and its technological abuses depends on the construction of a state of nature from which a fall from grace had occurred. He argues that:

*In virtually every aspect of contemporary living—from electric lights to all-night television to split shifts at work—we are literally punching the clock that maintains the synchronicity of our mind and body. In just a few decades of technological innovation we have managed totally to overthrow our magnificently evolved biological clocks and the complex biorhythms they regulate. [Dement and Vaughan 1999:98]*

Moreover, he claims that:

*Our loss of sleep time and natural sleep rhythms is the tragic legacy of a single and profound technological advance—the light bulb... Edison accomplished something Prometheus could not imagine, because he separated the light from the fire and offered it for our infinitely more convenient and flexible use. [Dement and Vaughan 1999:99]*

What is particular about Dement's understanding of the changes that were wrought by the advent of cheap electrical lighting is the way he imagines a behavioral change as occurring between two natural inevitabilities: the need for sleep and that the chronicity of life on Earth is increasingly mediated by the will of the individual who could break from these biological and geological predispositions. Not only was it a decision that individuals could make, but it was also subject to the whims of societies themselves, as some may choose to extend their days with "split shifts" and "all night television" and others may not. The flexibility that electric light allows for individuals and societies, the changes in sleep that this allows, stands in opposition to an inevitable natural order to be understood as a causal explanation for mounting complaints of sleep disorders in American society.

Throughout *The Promise of Sleep*, Dement makes recourse to what sleep was like previous to the demands of modern life, arguing pointedly that "Once we use electric lights, our [biological] clocks start lagging about an hour every day" (Dement and Vaughan 1999:95). This is understood as a result of the progressive push of human circadian rhythms, which are accepted to exceed the 24-hour daily clock by upward of an hour in some experimental settings. Electric lights allow individuals to lengthen the day, and the presence of sustained bright light positively reinforces the biological urge to stay up later each night. Dement argues that "Most likely we need the sleep debt accumulated during our waking 16 hours, plus a little extra, in order to fall asleep in 5 or 10 minutes and sleep through the night. The idea that a little sleep debt is good is a revolutionary concept" (71; a finding taken from Siffre 1964). In such a view, the progressive quality of the circadian rhythm becomes necessary for sound sleep, although due to the nature of fixed times for work and school in modern American society, the amount of sleep an individual gets in a given night decreases through the week, as one's circadian cues for sleep progress later into the night, while the timing of social obligations remain constant. Thus, Saturday mornings become a time to make up for a week's worth of diminishing sleep, which begins again on Monday, resulting again—ideally—in five nights of sound, but diminishing sleep throughout the work week rather than five nights of short sleep supplemented by daily naps.

The understanding of sleep that Dement forwards is one that is intimately tied to nature on one hand but is able to be manipulated by destructive social and individual decisions, which largely work to further divorce humanity from a primordial natural state. Dement posits this ability as a specific capacity of primates, arguing that “[P]rimates, including man, are able to compress their daily need to sleep into eight hours because they sleep more deeply and much more continuously than if there were no daily period of sustained wakefulness” (Dement and Vaughan 1999:78). Despite what might be read as an evolutionary hypothesis regarding humanity’s potentiality for shaping their spatiotemporal regimes, both at the individual and broader social levels, very little attention is paid on Dement’s part to the potential relationships between sleep disorders and evolution. This is particularly peculiar in that Dement understands humanity as innately linked with its environment, noting that “It is Earth itself that must act as a metronome, a timekeeper setting the tempo of our days. The bright light of morning and its dimming at dusk must synchronize our clocks each day, calling us awake and lulling us to sleep” (Dement and Vaughan 1999:92). In this view—where humanity’s rhythms of sleep are produced by the Earth, but there is the possibility of altering these rhythms through choice—sleep disorders are potentially understood as both biologically determined aberrations and socially produced decisions, as both diseases and disorders. This results in two sometimes complementary forms of treatment, one which focuses upon fixing the behavior of the patient, the other often promoting surgical, prosthetic, or pharmaceutical options. In clinical practice, which of these treatments is employed depends not only on the disorder but also on the ways the disorder is understood by the attending clinician. This is precisely what Dement attempts to curtail in the second half of *The Promise of Sleep*, a voluminous study of the various sleep disorders wherein he worked to delimit the understandings of sleep disorders into unitary nosologic, but differentiated, phenomena. In so doing, the many sleep disorders—insomnia, restless legs syndrome, narcolepsy, sleep apnea, delayed sleep phase syndrome, and so forth—are all understood as resting upon a biological foundation of eight consolidated hours of sleep, positioned at an environmentally conditioned time (between sunset and sunrise), but potentially disrupted by individual choices or social conditions: insomnia and delayed sleep phase syndrome are both understood by Dement and his followers as being largely the result of cultural or social influences, the former often caused by anxiety or depression, the latter as a result of choices to retire to bed late. In the case of the sleep disorders with recognized biological causes—narcolepsy, sleep apnea, restless legs syndrome—the cessation of each depends upon novel medical treatments. The work of *The Promise of Sleep* was to lay a new clinical and scientific foundation for the sleeping public of the late 20th and early 21st

centuries, building upon Kleitman's earlier work on sleep. Dement was able to operationalize Kleitman's conceptions of sleep as the basis for modern American sleep medicine, and, in so doing, moved the experimental conditions of the laboratory out into American society more generally.



#### CONCLUSION: THE AMERICAN PUBLIC, ASLEEP

The production of the contemporary American sleeping public—this conception of social life as predicated upon the biological, in this case, normative everyday life being based upon eight hours of consolidated nightly sleep without daily naps—depended upon Dement and other sleep researchers exporting the conditions of the laboratory to society. The ability to accomplish such depended in turn on an originary attempt to make the laboratory social, as in the case of Kleitman's descent into Mammoth Cave. Rather than the laboratory being purified of society and cultural expectations, normative conceptions of sleep and society were carried into the laboratory. Thus, the discoveries of laboratory studies of sleep were exported back to society as reifications of already held dominant cultural understandings of sleep. In other words, as part of his "satisfactory" experimental protocols, Kleitman managed to produce American ideas of sleep in the laboratory as a natural reality, which he reified as outside of culture. Normative patterns of sleep became the scientific basis of sleep. This reality was brought to bear on early sleep science and medicine, and laid the foundation for future research. Sleep, as it was understood by researchers and physicians throughout the 20th century, was not purified of its "culture" (or "cultures"), and yet this understanding of sleep laid the foundation for the production of biological norms and pathologies. In so doing, it serves as both a definition for "normal" sleep and how sleep might be harnessed for the production of everyday life's rhythms, as well as a means to curtail individual habits of patients and other interested sleepers. But Kleitman's and Dement's versions of sleep are not the only possibility; there are other models of sleep still, as embodied in what Dement accepted as cultural peculiarities and Kleitman construed as individual breaks from nature, whether aboard submarines or underground.

What brings together these three moments in the science and medicine of sleep are the suppressed possibilities of sleep's biphasic nature: the unruly nappers aboard the USS Tusk and USS Scabbardfish, the quickly acclimating Bruce Richardson underground, and the nonconsolidated, pathologized sleepers in *The Promise of Sleep*. Kleitman's scientific protocols attempted to disallow biphasic sleep and daily naps as a matter of course, in an attempt to prove the validity and utility of his spatiotemporal rearrangements; Dement, accepting the model of sleep forwarded by his mentor, employed this foundation as

a means to elucidate a medicine of sleep that accepts variance from a dusk-to-dawn, consolidated eight hours of sleep as pathological. As evidenced above, Kleitman's experimental protocols were infused with his cultural expectations of proper sleep and the ordering of everyday life, as well as the extreme conditions in which his hypotheses were tested; his understanding of sleep as *preferably* consolidated was twisted by the end of the 20th century to be *inevitably* consolidated, as evidenced in Dement's medical science. In this transformation, how experimental systems in the life sciences become closed by the practice of medicine becomes apparent (Rheinberger 1997): to make science serve capitalist interests, its doubts about biology must necessarily be truncated for the sake of social obligations, especially when ready treatments—in the form of pharmaceuticals—present themselves. Although Kleitman's scientific practices may have been flawed by his cultural expectations, the sleep medicine forwarded by Dement and other American physicians reifies social obligations as natural rhythms of life; where one might break from these rhythms is either in biological pathology or social deviance.

Although we might be inclined to see the ubiquity of sleep pharmaceuticals in modern American society as radically new, as without history, their presence depends upon the laboratory research of Kleitman at the turn and middle of the 20th century. Likewise, the contemporary American concern with a “good night's sleep” has its roots in the experimental protocols forwarded by Kleitman and succeeded by Dement. And Kleitman, in his turn, was influenced by a century of American and European medicine and science regarding sleep—as well as dominant cultural tropes of sleep and efficiency accepted by Americans and stretching back in their usage to the 17th century (Wolf-Meyer 2012). What was new at the end of the 20th century was the scale of these conceptions of sleep, human nature, and society: now rooted in science, individual decisions, behaviors and physiologies fell under the auspices of emergent conceptions of nature and society in which nature was necessarily cultural yet simultaneously perceived as primordial and untouched by modern social expectations and arrangements. Although Richardson's and Kleitman's experiences differed in Mammoth Cave, despite the ability for the U.S. military to operate even with unconsolidated sleep, and in the face of growing rates of sleep disorders in American society, the scientific understanding of sleep as necessarily consolidated and inflexible remains. In losing flexible sleep, Americans have come to be ruled by a hegemony of nature that obscures its social foundations. And this obscuring occurred through the use of science and medicine.

A historiography that attends simultaneously to the processural components of society as well as the dormant structures that underlie the present is vital in unsettling this hegemony and the expectations of nature, society, and individuals that have resulted in the pathologization of contemporary everyday

life. To recognize this complexity, new models of historiography and ethnography need to be forwarded to expose the shifting, unexpected forces of actors at work; the historiography of emergence that I lay out here is one possibility for recovering the long histories that confront us in our daily lives. Deleuze and Guattari might seem strange allies in the development of an anthropological historiography of emergence, but it is precisely their attention to the molecular transformations in life that lead to social changes more generally felt that provides the basis for a history of newness. Pairing Deleuze and Guattari's ontology of immanence with the empirical attention of Latourian ANT reveals the many actors that comprise the current basis of American sleep, both historical and current, from individual scientists and physicians, to institutions invested in sleep, to the chemicals that wake and lull us on a daily basis. While Americans might like to think of their sleep as intimately their own, it belongs to a history of becoming centuries in the making and influenced by a science and medicine of sleep that has never uncovered primordial human sleep but which has obscured its own presumptions of nature, self, and the social.



#### NOTES

1. This history has largely been reconstructed through Kleitman's discussion of the events in *Sleep and Wakefulness* (1963[1933]) and his papers at the University of Chicago's Special Collections Research Center.
2. My language is based upon Dement's own, drawing from a passage in which he remarks that "If the nightly sleep loss was more substantial, say four hours, it would be impossible for this to happen every night because the homeostatic sleep drive would simply become so strong that sleep is *inevitable*" (Dement and Vaughan 1999: 147, emphasis added).

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