Motor-mouth theory: The case for a REM dream type as probes for motor maintenance of articulation

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Summary. The origin of a common type of dream, here named the "Holophrastic Linguistic Dream type" (**HLD-type**), is considered. In the Motor-mouth theory presented, these dreams are run by the brainstem for motor maintenance of articulation, a motor activity required for efficacious speech, to give each tested word a stable phonology in use. The theory rests on a proposal that motor maintenance (**mm**) functions have always been the physiological purpose of REM-state sleep (**RSS**). Did HLD-type dreams begin when speech began? Our written record of HLD-type dreams extends back only to the beginning of writing. The idea of this role for them arose out of the two fundamental observables in every collection of HLD-type dreams, including mine: 1. Holophrastic is best used in the report of the HLD-type dream. 2. Using holophrasis, the dream report puns a *true context*. (The *true context* refers to puns among the words or speech sounds in the report, which relate to the dreamer's concerns at the time.) The RSS function occurs very broadly among biota on earth. It is very old, perhaps hundreds of millions of years old. In H. sapiens, specific Brainstem Region Circuits (**BRC**) will run this form of sleep, the RSS. The BRC will include the medulla oblongata, which apparently controls Cranial Nerve XII, the hypoglossal nerve that innervates the crucial tongue muscles needed for speech. When meaningful calls and words originate in any species using RSS, a new motor function also must begin – articulation, and it must be maintained by a new mm function. For a narrative hook to hang my theory on, the essay imagines the beginning of word-use in an archaic Homo species, some 2 million years ago. That new mm function was quickly implemented for nightly testing by the BRC, which adapted a test by initiating dreams: the HLD-type.

Keywords: Motor-mouth theory, Motor maintenance in REM, Speech, Articulation maintenance, Dreams as adaption, Holophrastic Linguistic Dreams, HLD-type dreams

1. Introduction to the Holophrastic Linguistic Dream type (HLD-type)

We sleep. We dream. In 1953, we learned that dreaming frequently occurs during the state of sleep associated with our eye balls jerking under closed eye lids. This was named Rapid Eye Movement sleep (Aserinsky & Kleitman, 1953) or REM-state sleep (RSS), as I abbreviate it. RSS takes up some 20-25% of total sleep time. What was missing then, and still is, was the purpose of RSS. This essay takes up the discovery of RSS and proposes its biological purpose. I will start by defining some terms, and periodically I will introduce other terms.

1.1. Saccades: the jerky eyeball movements

The jerky eyeball movement is called a saccade. Saccades are important to this essay and details are discussed. Saccades occur on and off during RSS, typically while we dream, and also during awake-state, where they perform in two ways: Slow pursuit, while tracking something moving or while reading, and sudden jerks to focus on something novel, named the "orienting reflex".

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1.2. Holophrastic speech: the earliest form of speech

To appreciate the value of Motor-mouth theory for understanding dreams one must use the holophrastic form of speech when recalling or reporting a dream. Here is how: Recall anything in a dream scene. Ask yourself: "What was that about?" Answering with only a few words is the holophrastic form of speech.

Holophrasis is the earliest form of speech (Bickerton, 2003). "Holophrastic" is a modern word invented circa 1860 (Dictionary, Accessed 8 Dec. 2021). It denotes the use of few words, -- a small number, as few as one or two, or an idiom, often with a gesture. It remains the first form of speech by toddlers. She may say, "Uppie!" and point to something on a high shelf, asking by one word and a gesture to be lifted there. Adults frequently use holophrasis for idioms, including curses, often with finger gestures, sometimes rudely, but also for greetings or showing affection, agreement or approval.

Describing the dream using holophrasis produces a report of a "**holophrastic linguistic dream-type**" (**HLD-type**). Using holophrasis helps you side-step the urge to report the dream as if it has a narrative arc, which is the great confounder of much of modern dream research because HLD-type dreams have no narrative arc from scene to scene.

1.3. Archaic Homo: the Homo habilis invent words that stimulate articulation maintenance

This HLD-type dream type is conjectured to have started in order to maintain articulation, when the use of words first appeared –perhaps among an extended family or clan of *archaic Homo*, as in a Homo habilis camp or settlement. I use "archaic Homo" as a short way to claim a connection to this plausible ancestor species of H. sapiens. This term is often used and much debated in modern anthropology (Coopers et al. 2008; Reich et al, 2010; Abi-Rached et al. 2011; Curnoe et al. 2012). A summary (Homo habilis From Wikipedia) sets out the argument, with citations, that archaic Homo includes Homo habilis because… "H. habilis was proposed to have been a human ancestor, directly evolving into Homo erectus which directly led to modern humans."

H. habilis needed a way to monitor and maintain the articulation of words. Speech is not usable to communicate ideas from day to day unless the words are sounded more or less the same way each day by every speaker of them, with only small and gradual shifts in phonology over time or distance.

1.4. Brainstem control of articulation: the Brainstem Region Circuit (BRC)

To maintain articulation of words, the brainstem began HLD-type dreams. This essay proposes that the use of HLD-type dreams was a brainstem function, most likely in the Medulla Oblongata area just below the PONS. For convenience I refer to the location as the **Brainstem Region Circuit** (BRC). The location is likely centered on the medulla oblongata, because of the route and role of Cranial Nerve XII in speech, the hypoglossal nerve, which is the main motor nerve of the tongue that controls the speech articulators, as discussed below, but the exact locus of control of RSS in the brainstem is not my issue, today, and often I will refer to the BRC, and sometimes to the medulla.

1.5. A fable is spun to help picture the origin of HLD-type dreams

I tell a fable about the origin of HLD-type dreams. It is set in a community of H. habilis about 2 million years ago in what is modern Tanzania. It is a narrative fiction used to conceptualize the plausible onset of articulation maintenance in what was then already an ancient RSS function, through the addition of HLD-type dreams in this band of archaic Homo.

1.6. The argument is presented in a five-fold fashion, after the observables

Next, are the observables and following that the essay uses a five-fold presentation: First is the role of saccades. Second are the seven anomalies, where the main evidence is presented. Third is dream origin, the fable set among the H. habilis stone-age nappers. Fourth, is a review of how dreams have been construed and misconstrued by some of the main dream theorists, down through the ages. Fifth are related phenomena.

2. Two Fundamental observables in HLD-type dreams & Motor-mouth theory

2.1. The Holophrastic dream report, and its True Context

Motor-mouth theory proposes that articulation maintenance is occurring during HLD-type dreams. Supporting it all, are the two fundamental observables that occur in every HLD-type dream, as far as I can determine over many decades of collecting these dream reports in the wild and from injured clients (Arenson 1987) and reading about them. These are:

1. Holophrasis is best used in the report of the HLD-type dream.
2. Using holophrasis, the dream report puns a *true context*.

The *true context* observable directs the dreamer to alternative meanings or puns among the words or speech sounds in the holophrastic report, which relate to the dreamer's concerns at the time. The *true context* refers to what was then on the dreamer's mind. It will be on a topic that was among her concerns. The other observable, the use of the earliest form of speech, holophrastic, feels most appropriate as used to report a HLD-type dream. It captures the *true context* in a few words or an idiom. This is inferential evidence of the age of this dream type. This also avoids confabulation of a narrative arc for the dream report. One can infer from this that HLD-type dreams had a very early origin in the Homo line. This also justifies using a fable set so long ago, some 2 million years ago.

2.2. How the brainstem measures and maintains articulation

Assuming the forgoing, it might have happened like this: First, speech begins, using meaningful calls or words. Then in the brainstem, the relevant BRC, committed to its nightly job of motor maintenance during RSS, needs a tool to assess and maintain this new motor behavior of articulation – the motor aspects of speech – and so, picks through our brain's language circuit each night –perhaps during the first 90 minutes of Non REM sleep (**NREM**), and scoops out a few words. Most likely the words will be on the subject of a concern that was present as we fall asleep which explains the second fundamental observable –the *true context*.

Then, without any of a variety of presumed psychological or religious connections, or any underworld temptation, as have been ascribed to dreams over the eons, the BRC deploys the words as visual analogues during the 4 or 5 periods of RSS during which that night's worth of dreams occur.

The words scooped out while falling asleep or during NREM appear as images whose phonology, when reported, preserve the speech sounds in the original words to be tested. The dreams are first converted from speech sounds to images, phonology->orthography, conversion. This allows the speech sounds to be maintained in order but represented by the dream visuals that are the orthography of the words to be tested, and are in plain sight as the images of the dream, and they are plainly heard when it is reported using holophrasis. This is because, when the dream is reported, the process is reversed, and the conversion of the images is orthography->phonology. That is, dream images are converted back into the speech sounds of these words,

now to-be-tested as articulated.

2.3. Sorting speech sounds back into words

Sometimes, recognizing where the speech sounds are divided into words, or what the punny meaning is, can take some thought, because often the puns and the run-ons (concatenations) of the speech sounds in the dream report must be sorted, to find the original words. Several examples of the sorting problem are given in this essay and many more appear in my earlier paper. (Arenson 1987).

Here is an illustration of a sorting problem in dividing the uttered words into the original test words: I was told this dream by a girl who, by age, ideas and attitude, was an adolescent, but she had not outgrown her slender, child-like body. She told me that in the dream she was looking at a landscape. She said it this way.

"It was flat. It was flat to the horizon."

Had she been looking at her chest in the mirror before bed? If so, now say to yourself, "her eyes on". It has almost identical speech sounds to "horizon", the word she used to describe the dream visual. Perhaps what she saw in the mirror was what she had "her eyes on", and that was the holophrastic pun in the dream report, which allowed the brainstem to assess the articulation of several words. Her report of the visual memory of these images shows her forming the orthography of the speech sounds that she will utter aloud or subvocally and which the medulla can use to compare to a stored version and assure her articulation.

Familiarity with HLD-type dream interpretation helps this argument. I named the interpretive technique "Cipher-method", a name I borrow from Freud's word in German *Chiffriermethode* (Freud, 2012). Freud mostly used Chiffriermethode, which translates as "Cipher method". In one place he used a related word, Chiffrierverfahrens, which translates as "Encryption method". The meanings are little different in my context, and "Cipher" is shorter. I use it descriptively. He used it derisively. Here is a link to my blog. (Arenson, K. M., 2017-2020, blog).

2.4. I will tell a fable of the first dream, and then the historical context

My early stone age fable (see heading "Dream origin") connects the invention of lithic core and flake technology by archaic hominins, the Homo habilis, to the earliest use of words and then, very soon, to dream onset. Speech, using words or meaningful calls, falls far short of its potential if a word or call has no consistent phonology. If it is pronounced the same way each time, it becomes so useful that when meaningful calls or words began it is plausible that the brainstem quickly developed a way to test and maintain articulation to insure speech efficacy, at least within the clan, and then for the advantage of the region or country or empire, as Homo spread.

An intriguing parallel to recent work on sleep learning recently came to me in a personal communication (Kuiken, 2021) that pointed to research done a decade ago on learning a tune while asleep (Antony et al, 2012). That work depicts an adaptive function, just as I present here. The capacity to enhance learning of a tune while asleep can be viewed as a spandrel of speech maintenance, my correspondent suggests, in part, saying about both, "…(t)he primary adaptive function resides in speech articulation" (Kuiken, 2021). His entire comment is set out in sec. 7, see heading "Related phenomena".

Cranial Nerve XII not only innervates tongue muscles used in speech, it also innervates chewing and swallowing. My proposal is that the BRC performs nightly motor maintenance during RSS (which nightly maintenance is the original and continuing main purpose of RSS). Articulation assessment, then, is but one of the mm programs. The BRC may trigger HLD-type dreams as its probe of the linguistic activity in order to allow articulation to be assessed when the dreamer awakens and recalls the dream scene. The BRC then is able to perform this novel mm function.

Following "Dream Origin" and the fable of the onset of HLD-type dreams when words were first used by Homo habilis, the essay considers "Dreamtime" and "Everywhen" from Australian aboriginal beliefs.

Then, under "Dreams as insanity..." I consider the ancient beliefs in the nature of dreams that grew up to explain the peculiar hallucinoid experience of a dream, where one feels like they are out and about in the real world (Foulkes et al, 1966). I ask if the belief in spirits and an underworld that is associated with dreams in most every culture, originated and spread with the onset of dreams triggered by speech. This belief may be as old as language. Existing dream theory, mainly Freud's and Hall's, are briefly reviewed.

In section 7, stone tool use in Japanese macaque 'stone handlers' is considered. When first noted, the investigators could find no adaptive purpose in stone handling, other than the physical pleasure. Three decades later the macaque provides convincing demonstrations of adaptive use of stone handling, as a tool in butchering shell fish. In more or less one lifetime of those creatures, the macaque adapted the new behavior. How quickly adaptions can occur! Other animal models that demonstrate a capacity for vocal learning are mentioned. "Vocal learning" refers to a "level of control over the sound production apparatus" (Janik et al, 2000).

The essay adopts the conjecture of existing theory on infants' motoneuraxis that suggests a form of mm twitches occur during RSS, which assist their brain-motor development and references are given to the work of the Blumberg group. The mm function is presumed to exist in all vertebrates during RSS, which is treated as the fundamental premise to the Motor-mouth theory, mentioned next.

2.5. Motor-mouth theory

Motor-mouth theory is a new theory built on top of a new theory: The new bottom theory is that the biological purpose of REM-state-sleep (RSS) is motor maintenance (mm) that runs RSS from the brainstem. There is existing consensus that RSS is a stage of sleep, that is, it is a state or an outcome, as well as sometimes referring to the movement of eye-balls in a rapid and jerky fashion during the state.

Here is another definition: When I want REM to mean the eye-balls moving, I write s-REMS, meaning sleep saccades (Andrillon, et al, 2015). I contrast this with w-REMS, the saccades of the waking state, mentioned earlier.

Unique to RSS, bouts of atonia occur and disappear many times during a night's RSS. Most of the voluntary muscles become unresponsive during atonia, causing a temporary paralysis. The medulla is implicated in the onset of RSS and in the control of atonia. Saccades during RSS are not subject to atonia. Dreams in RSS usually occur during episodes of atonia, and often occur with saccades, the s-REMS, which are immune from atonia.

Dreams are an add-on feature of these various brainstem mm functions that existed for millions of years before the development of language made dreams necessary for articulation maintenance. Adding dreams to the mm functions leads me to the Motor-mouth theory.

It seems likely that this occur in all species with RSS, beginning if and when they achieve meaningful-calls that depend on accurate articulation to carry or spread meaning among their kind.

Recent evidence of RSS in the cephalopod, Octopus vulgaris (Medeiros, 2021), suggests that motor maintenance occurs in invertebrate sleep, as well, a not surprising finding. This does not imply dreaming, unless they have meaningful-calls that need articulation maintenance.

Among land (or sea) creatures that do have meaningful-calls, it is plausible that dreams began to occur many times to maintain articulation of the calls in ancestral species. This could well have occurred before the earliest homo arose, the archaic hominins that led to H. sapiens.

Is it plausible that articulation testing by the mm function had a sudden onset, only making its appearance after words first appeared? Aside from the example of the Macaques learning to use stones as butcher tools in 30 years, discussed in sec. 7.2, under "Related phenomena", there is also the well-established Flynn effect of increases in average IQ scores of some 3 points per decade as proof of how rapidly a cognitive capacity in H. sapiens can emerge or strengthen. Mechanisms that occur with such speed are suggested for the origin of episodic memory (Tulving, 1993; Tulving, 2002), and I suggest this speed occurred as well when the need for articulation testing began. Episodic memory is needed to report a dream. Adaptions may emerge other than through slow (neo) Darwinian evolution.

My conjecture is that dreams of the HLD-type emerge in step with the development of meaningful-calls and words in every species with RSS. Hence, HLD-type dreams and speech will have come into existence close to the same point in the developing biology of archaic hominins and may have occurred repeatedly as new archaic Homo species developed meaningful calls or speech.

I went looking for similar ideas about motor maintenance from other researchers and did find those who studied motor development in infants, but they limited themselves to ages of infancy to childhood. They do recognize the motor development function in relation to twitch commands of the motor neuraxis as probes of voluntary muscles during the atonia of RSS, but it was not connected to motor articulation maintenance using dreams as probes, as I do here. These workers believed the twitching is an intermediate step and that it is anchored in the overall motor development of infants (Blumberg, 2010; Blumberg and Plumeau, 2016; Blumberg & Coleman et al., 2013; Blumberg & Marques et al., 2013; Sokoloff et al., 2015).

The Blumberg group, and other proponents who believe infant motor development is determined or assisted by twitches during RSS, to my knowledge, have yet to declare the boundary where or if the path they track as the child ages will turn or end or pass into an adult form, such as the motor maintenance (mm) function that I propose begins at puberty. This essay argues for the likelihood that the function persists past puberty in the form described here.

The HLD-type of dream was reported in writing before now, if infrequently (Aristandros of Telmessos, 380-328/7 BCE; Artimedoros of Daldis, 134-200; (Rabbi) Yose ben Halafta c. 200; Freud, 1899, 1913; Sharpe, 1937; Arenson, 1987; Hunt, 1989; Holzinger, 1994, 1997, 2015; Kuiken, et al 2001; Gratton & Séguin, 2009).

HLD-type dreams are perhaps the most common of dreams. I find them in every language in which I have had access to dream reports. Over the years I have collected examples in 8 languages where HLD-type dreams were told to me and where I listened for and heard the holophrastic form and located the punny reference to the *true context* (Arenson, 2017-2020).

Because the mm function seems to plunder the language thoughts of the dreamer as she falls asleep, and then uses language circuits that converts the words (or speech sounds in them) into dream images, dreamers often will recognize the image-words personal provenance through puns that connect their concerns at the time to the tested words in their dream report.

The Motor-mouth theory stipulates that no *a priori* narrative arc is allowed to influence the dream report. In HLD-type dreams in adults, dream scenes are not connected by a narrative arc, although the conventional wisdom often assumes they are. A narrative by definition is a re-telling of events at a later time and as a practical matter, cannot be made 100% accurate. For one thing, it depends on the point of view adopted by the narrator. Therefore, using a narrative arc necessarily imposes a false context, to some extent, and context easily distorts the meaning of words in a dream report. This is because the chosen context places the words' meanings in strictures. A word in a HLD-type dream report is specific only to the *true context*, which are the dreamer's concerns at the time, and that she is aware of, at some level. That concern is extrinsic to the dream scene. The crux here is to allow the words used in the report to be considered by her without imposing a narrative context that our culture (and the prevalent dream theory) may claim are appropriate for a dream report. Keep in mind that narration is a "meaning-making activity" (Macdonald, 2002). It must be avoided, to allow the *true context* to surface.

Also note that the biological needs of the brainstem are not likely affected if the dreamer does not get the pun. Comparing the word's articulation to a standard will occur even if the dreamer fails to recognize a punny meaning that reflects some *true context* in her life.

With a little effort, however, one often can glimpse the pun after using the holophrasis form in the report. This is a kind of payoff from the brainstem, which allows one to witness the blunt, colorful, holophrastic articulation of something on our mind. Always fun! But is it deeply meaningful? Sometimes, it is, if what's on our mind is deep and meaningful, but that is aside from the biological purpose of articulation, which the dream is to serve. The brainstem is doing motor maintenance not psychotherapy or philosophy, in Motor-mouth theory

There are a multiplicity of dream types (Hunt, H. T. 1989). I count 7 so far. From my perspective, these include Non-REM dreams, lucid dreams, post-traumatic nightmares, and night terrors. There are also dreams of those with dissociative identity disorder (DID), which present a unique puzzle as to which personality is hosting the dream if one wants to associate the *true context* in that dream. Also, I have encountered a new type of dream, which occurs before puberty: children's narrative dreams. With the HLD-type, we have 7 dream types already known. Which dreams came first? Perhaps the other types emerged over time as distinct

forms out of the HLD-type, since all dreams share some features of the HLD-type. The non-HLD-type dreams are not otherwise substantially addressed in this essay. Were there dreams before the HLD-type dream came into existence during RSS?

3. The role of Saccades (1st fold)

The onset of the motor maintenance function may need a nightly start switch: Saccades of RSS are my proposed trigger as they (and saccades while awake) are known to activate the language circuits from which holophrasis emerges.

I am proposing that the brainstem of the species of archaic Homo, as they developed calls and words, came under adaptive pressure to manifest a function guarding the integrity of articulation from day to day and the cranial location was likely in its BRC region. In Homo sapiens, that would include cranial nerve XII, and its brainstem location passing through the medial medulla oblongata. This is the biological niche that HLD-type dreams appear from.

Saccades give the appearance of initiating the night's multiple occurrences of HLD-type dreams (Arenson et al, 2015). Saccades, therefore, may be the prerequisite to the performance of articulation testing by BRC using dreams as probes.

There is evidence in the literature that shows saccades during RSS triggers the brain in regions associated with the language network (Andrillon, et al., 2015; Miyauchi, et al., 2009; Dehaene-Lambertz et al., 2018). Especially striking was work done in Beijing on Chinese readers, as appears in the "Overlay" study (Zhou and Shu, 2017). Also, from that same lab of Professor Shu, the "Circuit formation" study (Zhou et al & Shu, 2018). These two studies from the Capital Normal University lab in Beijing establish that saccades and the language network co-activate in brain regions where linguistic dreams may organize during times when we know dreams are occurring, (and this is not falsified by acknowledging that these studies on Chinese-reading college students were done on subjects while awake). With this plausible linkage between the eye movements, the brain during REM-state, and the language network, the motor maintenance (mm) function is posited to perform the task of maintaining and testing all the motor functions essential for the routines of existence in every species with RSS, and including monitoring and regulation of articulation of words or meaningful calls in species that have them – a motor activity of great usefulness, which assures efficacy of speech.

3.1. Allusive words

Two dreams, one classic and one modern, illustrate an issue that was unlikely to occur when archaic homo had few words and HLD-type dreams had just begun. With many words available in the modern era (our records only goes back to the origin of writing), one confounder in dream reports is an allusive word that matches the *true context* in an allusive sense, but is not bang on the holophrastic intention to express the *true context*. Sometimes, there are extra words in a dream report that might contribute to the Cipher-method meaning, but, again in the illusive sense.

Consider the earliest recognition of an HLD-type dream when it was reported: This was a dream of Alexander the Great in 332 BCE when the city of Tyre had been withstanding his siege for months (Freud, 1913 at p.82). Alexander's army was conquering as they swept along the Mediterranean coast until they reached the walled island city of Tyre (Greek "Tyros") on the coast of what is now Lebanon. There his advance was stopped, and for 8 months his siege and repeated attempts to breach the city walls failed to force the city to surrender. No city would ever again withstand him for so long. His army was destined to capture the Mediterranean coast around to and including Egypt, but Tyre was successfully resisting. He must have been beside himself. His father, Philip II of Macedon was along to witness events in his son's first campaign, with his dream divinator, Aristandros, (a colleague of Aristotle in King Philip's court). Alexander would visit his father's tent, regularly, and vent his frustration. One time he told them of a dream. We know of it because Aristandros wrote a book about his method of dream interpretation, which was similar to the Cipher-method that I use. He considered, as I do, if a word can be divided into two or more smaller words, *de-concatenated*. This occurs because the orthography -> phonology process, where the dream image is converted back into words, operates at the level of the speech sounds so where a break is meant in order to form the next word can be ambiguous.

He wrote that Alexander reported the dream like this (translated from Greek) (Aristandros of Telmessos, 380-328/7 BCE),

A Satyr [Greek "Satyros"] is dancing on my shield.

Aristandros evidently decided he could ignore the "dancing on my shield" part, and he interpreted the *Satyros* image, spoken as a one word holophrase, as a concatenation of two smaller Greek words "Sa Tyros", or "Tyre is yours". Alexander was emboldened to try again and this time succeeded in breaching the walls.

What value was added by the dream report of the image of the Satyr "dancing on my shield"? Why did the dream bother to picture the Satyr that way, when it was enough for the two word holophrase, *Sa Tyros*, that a Satyr was present, whether dancing on his shield or not? One might think of lost battles; perhaps the Satyr is the city dancing on Alexander's shield? Thus, on the one hand, the dream might reflect Alexander's fear that he may lose the battle for Tyre; but on the other hand, as Aristandros noted, "Sa Tyros!" He wins it! (Notice that we don't get to the other hand until we decipher the concatenation.)

Once we have deciphered the words that best represent the concern of the dreamer at the time – the *true context* – often we can see a kind of metaphorical reference to the subject matter in secondary images in the report. I call this an allusive reference. It occurs commonly in HLD-type dream reports. Sometimes the allusive reference is so prominent that it throws us off, or masks a more exact holophrastic statement, as we will see from the Yellow Bus dream.

L'autobus Jaune (Yellow Bus) dream was told to Monique Séguin L.P.N., a Quebec palliative care nurse (Gratton and Séguin 2009). In searching for meaning in HLDs, the *true context* is found in relation to the dreamer's life and concerns at the time of the dream. Rarely, the *true context* coincides with some part of a narrative report of the dream's scenes, and if so, I almost always find that the words are used as allusions. To recognize an allusive sense also requires that the *true context* is known already, or can be surmised. For a powerful illustration of this, find this book – written in French and also published as an English version – which gives examples of dreams of Séguin's Francophone patients that have allusive meanings that coincide with the *true context* of

concerns of palliative patients, and which is often their impending death. Here is the first such dream heard by Nurse Séguin. The dream report, as translated from the French for the English edition of their book, was

"I am standing in a yellow bus full of people. I look out the window and wonder: Will I know when it is time to get off? Is there someone who will tell me when I must get off the bus?"

As an allusive concern over one's impending death, "Will I know when it is time to get off?" seems clear enough, but I found the French version of the book more powerful. Here is that dream report in French.

"Je suis debout dans un autobus jaune rempli de monde. Je regarde par la fenêtre et je me dis: «Est-ce que je vais savoir à quel moment descendre? Y a-t-il quelqu'un qui va me dire quand je dois sortir de cet autobus?"

The word descendre in the French version, *"Est-ce que je vais savoir à quell moment descendre?"* provides one word of holophrasis that puts the HLD meaning beyond peradventure. This is because *descendre*, which is correct Quebec French for getting off a bus, can be heard as a concatenation of two words and can be de-concatenated, just as *Sa Tyros* was. If we de-concatenate *descendre*, we get these two words:

"des" = the (singular or plural)
"cendre" = ash of cremation

The Cipher-method interpretation with an English translation of "…time to get off" treating the word as spoken holophrasis, is uttered like this

"Est-ce que je vais savoir à quel moment des cendre,"

which in English becomes something literally like …

"Will I know when it is my time to become the ashes of cremation?"

Des cendre, as a holophrastic de-concatenated usage, delivers a more trenchant meaning, than comes from an allusive sense of the longer word, "*descendre*". But an allusive meaning often makes an appearance and sometimes gives a clue to the meaning intended by the motor maintenance test of articulation before the word itself is identified. In 2017, Nurse Séguin (personal communication) endorsed my translation and this approach to the original French (Séguin, 2017, personal communication).

I note that both languages produce similar meanings by metaphor. The allusive "time to get off" is more general but could mean her impending death knowing the *true context* that she is a palliative care patient, whereas the blunt metaphor of holophrasis, *decendre*, "time to become the ashes of cremation", is more redolent of that thought of her death. They are articulated the same.

This exercise of discerning the holophrastic test word or phrase may be aside from the articulation testing purposes of the motor maintenance function. Provided that the dreamer articulates the test word aloud, or to herself, the brainstem's mm function is likely indifferent to whether the dreamer 'gets' it because testing of articulation can occur anyway.

4. Anomalies accounted for (2nd fold)

The anomalies are presented in lieu of experiment. I view them as evidence of the Motor-mouth theory. Seven kinds of biological anomalies whose origins are unexplained by existing theory are presented and are resolved by the mm articulation testing conjecture in this paper. These anomalies are consistent with the Motor-mouth theory that HLD-type dreams arose originally for nightly motor maintenance when words appeared. The seven anomalies are:

- Ocular quiescence; periodically during the time spent in the Rapid Eye Movement stage of sleep, which I call "REM-state sleep" the eyeballs are still;
- Pubertal onset of the mm function and of HLD-type dreams;
- Penile and clitoral tumescence/engorgement puzzles;
- Bruxism;
- Dream recall fails;
- Atonia that reduces sleep predation while allowing mm twitches;
- Full activation through mm of voluntary muscles during RSS in a person without atonia in response to REM Sleep Behavior Disorder (RBD).

4.1. The first anomaly, ocular quiescence during RSS

The anomaly here is that during RSS the eye-ball movements, the s-REMS or "sleep saccades", turn off and on some 21 times during a night's worth of RSS. We must notice that *Rapid Eye Movement* was a misnomer for the state described by Aserinsky and Kleitman in their epical paper (Aserinsky & Kleitman, 1953) because the name contains a self-contradictory statement when the eyeballs are not saccading but the so-called "Rapid Eye Movement" sleep state continues.

When the idea came to me that articulation testing is a motor maintenance (mm) function, that penny dropped for me and I did notice the inaccurate name that contradicted ocular quiescence during RSS periods. In Motor-mouth theory, during RSS, brainstem neurons are conjectured to run the nightly routines of the mm functions. This may begin by setting RSS running some 90 minutes after sleep onset, if only for 5 minutes on that first occasion, and then repeating a total of 4 or 5 periods of RSS each night with increasing duration in each RSS period up to 15 to 20 minutes for the final period of RSS. But here was the confounder: Within these 4 or 5 periods of RSS, the s-REMS turn off and on, an average of 21 times during the whole night, while REM-state itself (RSS) is still running. Aserinsky wrote this up in 1971, but he had no proposal to account for it (Aserinsky, 1971).

Did this inappropriate choice of name impede the insight described in this essay? It cannot be ruled out. Here and in other writing, Aserinsky drilled down into REM-state sleep behaviors by empirical studies of the nightly on-off pattern of sleep saccades (Aserinsky, 1996; Aserinsky, 1971; Aserinsky and Kleitman, 1955; Aserinsky and Kleitman, 1953).

From Table 2 of Aserinsky's 1971 paper, we see that the s-REM occurrences when combined into bursts occupy just a portion of the duration of the night's RSS.

In reference to REMPs (REM Periods), meaning one of the 4 or 5 periods of RSS in a night, he writes (Aserinsky, 1971): "The average amount of ocular activity in the first 5 min of the REMPs was 32.1 sec. which increased to 47.2 sec. in the next 5 min. and was then down to 26.5 sec. in the 15-20 min. segment of these REMPs." Taking the average of the

high and the low of the 5 minute figures during REM-state sleep in one night yields an average of just over 12% for the time occupied by s-REMs during the whole 5 periods.

Using the 5 minute intervals approach, we can calculate the time used by eye ball movement during REM-state, which is in the order of 12% of the 20-25%% spent in REM of all sleep time. i.e. some 2.7% of eye ball movement is in a night's worth of RSS +NREM.

This appears in Aserinsky's measurements, particularly in his 1971 paper, and also from Andrillon & Nir's work (Andrillon et al., 2015).

At one point, most workers thought RSS was the time when we dream, and that is partly true, but we now know that dreaming also occurs in Non-REM sleep (Siclari et al, 2017). Whether NREM dreams are of the HLD-type is at present unknown. Kleitman seemed unconvinced of a connection of RSS to dreams. In the 1953 study and all since then, it was seen that in some 25% of awakenings in RSS there is no dream report.

For my present purpose, the most intriguing aspect of ocular quiescence is that the s-REMs come on and go off some 21 times during a nights worth of REM-state sleep. In his 1971 paper Aserinsky reported,

> *"On the average there were 21 intervals of ocular quiescence, ranging from 1 to 5 min duration, in the REM phase of one night's sleep".*

Why is that? Why is there a quiet period of 1 to 5 minutes without the s-REMS, some 21 times a night during REM-state sleep (RSS)?

The short answer may be that each brain circuit with a motor component that while awake can stimulate a saccade, both of the voluntary variety, or the reflex for the Orienting Response, (w-REMS), is put through its paces during RSS, tested individually with gaps to reset or reorient the mm function system to the next saccadic network. It may be possible to identify and count the processes that activate a saccade while awake such that mm function testing of it occurs during RSS.

From the perspective of the motor maintenance function, in those quiescent intervals what occurs may be the testing of the many other non-saccadic motor functions, where the sub-routines of the mm function is using twitches, when atonia is on. So, with atonia on it remains possible to test voluntary motor behaviors throughout the motoneuraxis with twitches including the ones to be mentioned shortly in this section on anomalies.

The misnaming of this stage of sleep occurred differently in France, where Michel Jouvet called it (in translation) "Paradoxical" sleep, which is also misleading if in a different way. I for one don't get the paradox. Some says it's because the EEG of RSS resembles the awake EEG. True it does. How is that a paradox? In Motor-mouth theory, one might assume the similarity was due to massive motor involvement in both states. If a new name for REM-state sleep has become timely, I suggest the "Motor Maintenance Function" state of sleep (MMF-state sleep or MSS). In this essay I will hew to the old name or my variation of it, "REM-state sleep" (RSS).

4.2. The second anomaly, pubertal onset of mm and HLD-type dreams

This linguistic dream type of HLDs begins at or about puberty. I believe this based on my inability to detect HLD-type dreams earlier than that from children I was close to and talked with about dreams. Despite this being "absence of evidence and not evidence", I concluded there were no holophrasis in dream reports of younger children, who do report vivid, narrative dreams. These reports are unlike how they will report their dreams after puberty – the difference is in the linguistic structure of the dream. In adults, rarely, if ever, is there a continuous narrative that unambiguously links scene to scene in the dream but it does seem to occur in children's dreams. One of my daughters, Emma, had detailed narrative dreams of a time machine that she could return to night after night and use to explore her dream world. This series ended by puberty, I think. I realize one could say the pun was a reference to her growing body that she was mastering, and that was her vehicle through time. This was too abstract for the holophrastic usage I had become familiar with.

The dreams of children need more research. It is known that nightmares and night terrors appear at different ages. Perhaps it is five years old for nightmares (the typical age of onset of episodic memory, according to Tulving, and others), with night-terrors (which occur early in the night, well before the 1st REM-State period) beginning before age 5, perhaps as early as age 3. Parents often (always?) confuse night-terrors for nightmares, so reports of nightmares in children under 5 by their parents are unreliable. The little research that exists is potentially flawed because of this (Hawkins & Williams, 1992; Simard et al., 2008). There is no need for episodic memory in night-terrors because there is no content, except the frightening emotion.

My current estimate for the age of onset of HLD-type dreams is age 11 ± 2 years because that is the age when reliable narrative reports disappear.

4.3. The third anomaly, tumescence and engorgement of genitalia

I conjecture that mm is responsible for penile tumescence during RSS in all relevant species and also for engorgement of clitoral tissue. Jouvet's lesioned cats were seen to experience piloerection, a state sometimes associated with penile erection – viz., in a rat model (Fu et al, 2014) – during their RSS walkabouts (more on this below in the section on RBD). These functions are prevalent in mating instances that leads to procreation. This also tests the motor activity of blood vessel constriction and relaxation, which is needed for thermodynamic regulation and also by respiration, in addition to its role in the mechanism of tumescence/engorgement.

Although boys as infants or toddlers and in latency will become tumescent during RSS, there is evidence in the literature that tumescence with rigidity sufficient for penetration and procreative activity does not occur until puberty. Although not conclusive, I found three sleep studies on prepubescent males that support this (Halverson, 1940; Karacan etal., 1975; Wein et al., 1981). This is consistent with my observation that puberty is when HLD-type dreams begin, and both observations support the inference that the motor maintenance (mm) function begins then, as well.

4.4. The fourth anomaly, bruxism and Cranial Nerve XII, the hypoglossal nerve

A common behavior favoring the mm conjecture is bruxism, which during RSS tests the motor activity of chewing by molar grinding, and is useful to life. There is no consensus

that explains bruxism. But mm of behaviors essential or useful to that life as it is lived and as it adapts to the available food in the environment explains it well. Chewing depends on, and is significantly enabled by Cranial Nerve XII (CN12), the hypoglossal nerve, which is the main motor nerve of the tongue. Because it innervates almost all the motor activity of the tongue, including the tip of the tongue, it is also essential to speech and articulation, which implicates it in dream reports. CN12 originates in the Dorsomedial Medulla, which is a "critical structure involved in REM sleep regulation" (Stucynski et al. 2020). Debate has raged for decades over the role of the hypoglossal nerve in hominin speech (DeGusta et al, 1999). Perhaps thinking of it as a part of the regulator of articulation in addition to its other roles will help clarify the matter.

4.5. The fifth anomaly, dream recall fails

Dream recall fails have been repeatedly noted with no good explanations offered: why are dreams by adults so hard to remember? We experience dreams of the HLDs-type as if they were "…events out in the real world", as Professor Foulkes and colleagues observed in a classic study that defines this essential element of the dreaming experience (Foulkes et al., 1966). There, dreams were judged to be hallucinatory, or not, as scored on a *Dreamlike Fantasy scale* devised by these researchers. This sensation of being out in the real world is a hallucination since we are asleep in bed, but if one does not make a concerted effort to remember the dream immediately upon awakening, the memory is gone in half a minute or less. Why does the episodic memory fail so rapidly with HLD-type dreams? It appears that the episodic memory system in not engaged during HLDs. This oddity should be considered in the context that its function is to test articulation: It is not an experience biologically needed to be equivalent to being out in the real world. The adult dreaming experience may only need to briefly *mimic* being out in the real world to test articulation: the dream provides the brainstem with that night's answer to the fitness of the phonology that is spoken. This quickness of forgetting implies that anything recalled is merely incidental to the mm function, an opportunity to witness our brainstem at work when we awake, if we choose to use it.

4.6. The sixth anomaly, reducing sleep predation with atonia

Atonia or sleep paralysis during RSS is an unexplained anomaly. Sleep paralysis has long been reported. Its manifestation powered folk stories of the Night Hag or the Night-Maere, sitting on the sleeper's chest to prevent them from moving if they awakened, (during the atonia of REM-state sleep, we now know). After 1953, we saw that RSS was associated with this sleep paralysis and more specifically it was seen that atonia is associated with sleep saccades, the s-REMS of RSS. Atonia's adaptive function makes perfect sense when it onsets with s-REMS along with the motor maintenance (mm) function. Atonia is useful to mm every night: It improves the signal to noise ratio of the efferent test stimuli from the brainstem to cause muscle twitches. It may be even more important to improve detection of the afferent or reafferent sensory return signals. Both efferent Corollary Discharge and afferent Reafference may extend mm programs into periods of RSS without s-REMs. This may also account for some of the lengthy duration, up to about, 20 minutes, for dreams in the 5th period of RSS. Atonia allows energy saving for the mm function during RSS because the 'noise' of voluntary muscle movement is reduced if not absent. The reduction in signal-noise ratio benefits the mm programs. Without atonia, in those with REM Behavior Disorder (RDB), mm must somehow raise the signal gain on the test signals it sends out and detects coming back, in this much noisier environment of fully activated muscles. RBD probably leads to flailing muscles during mm testing rather than the twitches of normal mm testing that can be kept so much lower in vigor because of atonia.

The anomaly of atonia has always been the predation vulnerability it seems to create during RSS. But consider the alternative, assuming that mm is essential to the well-being of creatures with RSS: Twitching the muscles causes far less commotion and draws far less predator attention. Atonia allows mm to run with a minimum of visible activity, and the protection from predation afforded exceeds the disbenefit of the vulnerability created through atonia in the context presumed here, where mm is essential. If this were not true, atonia would have disappeared with those ancient animals preyed upon. Consider the spectacle when mm causes "complex behaviors" (Valli et al., 2012) in those with RBD during RSS, with flailing limbs or other attention-attracting behaviors, including laughter, (Siclari et al., 2011) since laughter is another articulation behavior, more of a call than a word, but conveying meaning as language does and calls may do. When mm is running, the absence of atonia during RSS will produce greater risk of predation. A creature (without RBD) while asleep is not thrashing about under the test conditions of mm, which can only twitch the muscles during atonia or saccade the eyeballs under the eyelids. The greatly reduced commotion will lessen predators' attention. This appears to solve the conundrum of atonia *vis-à-vis* the predation risk.

4.7. The seventh anomaly: REM Behavior Disorder, which releases strong mm function absent atonia

Here, the conjecture is that mm muscle activation appears at full strength, no longer as twitches, since twitches occur when atonia is present and in RBD it is absent. The new insight is that full muscle activation is needed to overcome the relative noisiness in the motoneuraxis due to the absence of atonia, while the medulla is monitoring what would otherwise be muscle twitches if the person had no RBD.

One sees that increased noise in the neuronal circuits from the absence of atonia may lead to a boosted mm signal that will provoke a fuller motor response than by a twitch, and which then *is mistaken for dream enactment*. (Some suggestive video evidence is presented in the form of reminiscences from a then grad student present in the lab of the Michel Jouvet.)

Also, I ask, do dogs with RBD enact dreams? (Shea, A., et al 2018). Do dogs dream? How does one falsify the belief that dogs dream? If it can't be falsified, is it science? Dogs with RBD are absent of atonia and will show full muscle activation during RSS due to the mm and motor testing function, I propose.

In H. sapiens without atonia the mm testing activity may resemble a full work-up of orthopedic functions. Are these routine test behaviors that are usually twitched out during atonia by mm confusing to an observer witnessing the

full blown behaviors seen in REM Sleep Behavior Disorder (RBD) when atonia is absent? It might be so. Perhaps Jouvet's brain-lesioned cats also were mistakenly thought to be engaged in dream enactment? This anomaly of RBD is plausibly explained as mm routines with fully expressed muscle activation when atonia is absent.

4.7.1 Carlos H. Schenck blames dream enactment

Atonia is regulated in the brainstem area near where twitches and s-REMs also are controlled. If atonia wanes or becomes absent by disease, REM sleep behavior disorder (RBD) is often diagnosed. An unnecessary conjecture to explain this was proposed in 1986 by Professor Carlos H. Schenck and colleagues (Schenck et al., 1986). Referring specifically to Jouvet's groundbreaking work lesioning cats in the 1950's to1960's, Schenck claimed that "dream enactment" explained certain prominent behaviors during RSS that would bring the patients to medical attention. These are sometimes called "complex behaviors" in the dream science literature, as the Revonsuo group of sleep/dream researchers did (Valli et al., 2012). A particularly revealing statement was made by Mahowald and Schenck (Mahowald and Schenck, 2004) who refer to Jouvet's 1965 work, saying:

> *"…Dr. Michel Jouvet placed bilateral peri-locus coeruleus lesions in cats and observed REM sleep without atonia (RWA) and "oneiric" behavior that could only be explained by "acting out dreams…"*

Independent authority was not cited and this surely is an overstatement: "…could only be explained by acting out dreams", considering what little is actually settled in dream science. The RBD behaviors witnessed in those without sleep paralysis can also be explained by motor maintenance (mm) routines. Dreams will occur during mm, as is argued in this essay, but to attribute the motor behaviour in RBD to dream enactment is doubtful. Arguably it was doubtful from the beginning, when one considers early video of Jouvet's cats as recalled some decades later, as reported by a former graduate student of Jouvet, Dr. Pierre-Hervé Luppi. I will quote Luppi (below) who writes of that video he saw in Jouvet's lab of some of the lesioned cats. The description can be heard as if he was describing the mm function. To me, at least, it sounds like a mm assessment of a cat during RSS who lacked atonia.

Also, in Schenck's paper (Schenck et al., 1986) the behaviors were reported as occurring during dreaming. This claim was based on patients' reports that they had dreamed of behaviors resembling what was witnessed by their bed partner, but this has not been confirmed in controlled study. Experiments that attempt to match patients behaviors observed and videoed during episodes of RBD with their dream reports are weakly negative, overall. See reference to work led by Associate Professor Katja Valli with the Revonsuo group (Valli et al., 2012). Blumberg says it is more likely to be dream incorporation than dream enactment. That is, the behaviors wake the patient and he becomes conscious of his movements and he falls back asleep thinking he has dreamed it, or perhaps then he remembers the movements he experienced forgetting he was briefly awake (Blumberg & Plumeau, 2016).

The next objection is that the belief that Jouvet's cats were acting out dreams is itself unprovable and unfalsifiable. Only the dreamer gets first-hand information and can tell us if she or he felt the telltale of a dream, that hallucinoid experience that felt like the dreamer was "out in the real world" as Foulkes *et al*., reported in their classic 1966 study (Foulkes et al, 1966). This hallucinatory sensation of being immersed in external reality is what separates dreaming mentation from visual thoughts while abed or asleep.

The simple fact is that a cat's subjective experience in RSS and whether it was a dream or not, is not now available to human observers and probably will not be until cats can talk. The claims of dream enactment to explain the observable motor behaviors in the lesioned cats without atonia, and applied to RBD, were then and are now unprovable/unfalsifiable allegations and therefore have greatly reduced probative value in scientific argument. Jouvet's lesioned cats cannot be the proof of dream enactment as the explanation of the complex behaviors in RBD, except by an observer who claims to somehow 'know' that such cats are experiencing a dream by the appearance of their EEG, although even in humans, RSS does not predict a dream in some 25% of awakenings (Aserinsky and Kleitman, 1953).

Post-surgery, survivors among Jouvet's cats went for a week or so without the appearance of REM-state sleep at all. (More than a few died at once or never awoke.) Then some of Jouvet's cats were seen to jerk their heads and wake up. Finally, after more time, some of these cats would remain asleep in REM-state and only then began the behavior that so electrified those workers studying sleep in cats and rats, and soon enough Jouvet became appropriately well-known by the public in France, and worldwide.

4.7.2 Jouvet's work reconsidered by Henley & Morrison

A decade after the results from Jouvet's laboratory, seven living cats were similarly brain-lesioned by Henley & Morrison (H&M) (Henley and Morrison, 1974; Morrison, 1983) with the aim of suppressing atonia in REM-state sleep while otherwise preserving that sleep state function. They performed lesions in a different region of the mid-brain. H&M's technique succeeded where Jouvet's had initially failed. Within a day of recovery from the brain surgery, H&M's cats entered REM-state sleep with a myoclonic twitch and jerk of the head and soon after got to their feet unsteadily. In another day or so, they began that ritual. I think of it as a ritual dance and refer to it as that, a dance (of hunting & pouncing), that is eventually seen in Jouvet's cats.

H&M disagreed with Jouvet on the significance of the head jerk but they do agree that the cats are dreaming in all but that name. They refer to it as "hallucinating" or "hallucinatory" or "hallucinatory-like" to explain the cats' motor activity. I have the same objection. To reach this conclusion of hallucination one must find some source from which to learn the contents of the cat's thoughts because the cats can't tell us. A hallucination is a hallmark of a dream. A person who has been in bed all night may awake and tells you she had an experience that felt as if it was occurring out in the real world. That makes it a hallucination. It occurred while she was asleep in bed so we call it a dream, by definition (Foulkes et al, 1966).

So, it is intriguing that H&M tell us that a "defect in maintenance" has occurred in a dispute with Jouvet over the head-jerk. I take this to mean they think a motor maintenance program is the missing function in Jouvet's lesioned cats. H&M do not support the conclusions of Jouvet over what causes this head jerk, which appeared to Jouvet to awaken his cats at first. Was it the dream enactment? According to Jouvet

(Jouvet, 1962; Jouvet, 1967) and Roussel from Jouvet's lab in his 1967 doctoral thesis, it was. H&M disagree, in effect saying that Jouvet's cats wake up because their necks jerk due to the absence of atonia, and this awakens them, at least at first, and only as time passes do they learn to stay asleep at the onset of the REM-state despite the jerk, and in that REM-state the *dance* is done.

In the course of their argument H&M conclude that "early postoperative period pontine lesions lead to poor regulation of motor functions in both wakefulness and paradoxical sleep and to a defect in *maintenance* of the latter rather than triggering." (Henley and Morrison, 1974) (Italics are in the original).

Motor maintenance (mm) provides an alternative to dream enactment to explain the observed motor behaviors during RSS in cats when atonia is surgically suppressed. There is no way at present to confirm in a cat what a human would call a dream experience. Dream theory should not be burdened to account for this unneeded dogma in RBD theory.

4.7.3 Was Luppi seeing mm testing behaviors?

Jouvet did not claim in English that his lesioned cats were dreaming. He had written that his lesioned cats were in a "hallucinatory-like state" in his 1967 English language paper (Jouvet,1967).This expression can easily be understood as an indirect way of referring to dreaming. In a paper in French with J.P. Sastre, however, Jouvet specifically asserted that the lesioned cats were in an oneiric state (Sastre and Jouvet, 1979). Indeed, he uses that specific word in the title: ("Le comportement onirique du chat"). "Oneiric" means dream, without question. I agree with Schenck that Jouvet meant his cats were dreaming in the context of that paper, but, one notes that the claim in English by Jouvet that cats experience *hallucinatory-like states* is just as unprovable and lacking in falsifiability as the claim that they dream.

One corollary from Motor-mouth theory appears here: The theory that HLD-type dreams began and still function as probes of words for articulation assessment does not disclaim the existence of dreams of other types such as during RBD RSS episodes, which may be dream incorporation from brief awakenings. For testing and maintenance purposes the motor maintenance (mm) programs, aided by Corollary Discharge (CD) and Reafference (RA), briefly mimic wake motor behaviors through efferent and afferent signaling throughout the motoneuraxis. During RSS, assuming the actuality of mm function, Jouvet's cats likely were experiencing mm's motor assessment of behaviors necessary for life as a cat. Did the cats experience it in a dream-like way, not as an HLD-type (no language thoughts in cats) but as a RBD subject might experience a dream without language?

My proposed understanding of what the cats experienced is supported by Dr. Pierre-Hervé Luppi, a former student of Jouvet who came to Jouvet's lab in 1983 but stayed on after his PhD for many years. He writes about a video he viewed that was from Jouvet and Sastre's 1979 lecture, describing the cats' movements (Luppi 2018) says:

> *These behaviours are indeed amazing to look at and show the different types displayed by the animals. They include jumping, exploring, grooming, attacking, threatening, defending themselves from a virtual aggressor, fearing something, and sometimes show piloerection.*

I was struck by the wide extent of the behaviors exhibited. Luppi describes behaviors of such breadth and such detail as would be expected if mm was running through a check-list or inventory of many of the useful motor behaviors for life as a successful cat. This check-list of events is more fulsome than is likely in any HLD-type dream, which typically is much more limited in scope, (more limited in humans, anyway and if we are forced to concede that the behavior shows cats dreaming although unable to tell us, we can be allowed to ascribe human dream patterns to the cats). Without atonia, the behaviors were fully activated and not merely twitching the necessary muscles for each motor behavior under mm test, which would have been the case in the presence of atonia before the pontine lesions. It is similar in appearance to what might be happening while the mm programs are running in human RBD patients during REM-state, who also lack atonia due to that progressive disease and therefore are obliged to act out the mm behaviors.

4.7.4 Is it dream incorporation or dream enactment?

Humans with RBD, lacking atonia, experience the wake-mimicking motor behaviors of mm during RSS as full activation, and sometimes are awakened momentarily. Then, as was suggested by the Blumberg group (Blumberg and Plumeau, 2016) the person without atonia-on wakes briefly and incorporates the complex movements he is experiencing into a memory. I am unsure that dream incorporation is occurring. The mental experience can't be explored except in retrospect by those who can talk, i.e. Homo sapiens.

The person with RBD, in the absence of atonia, may recall a dream and decide he was dreaming the behaviors that were experienced during brief awakenings as they manifested and become visible to him (and others), but research since then fails to support such dream reports. In a study of subjects with RBD by the Revonsuo group (Valli et.al., 2012) identified as a "pilot study", only a minority of REM awakenings produced dream recall; and neutral judges were able to begin to connect the dreams reported in most of these cases with the behaviors witnessed, although in some cases they were not. In those – that minority overall of cases where dream recall existed – the connections reached significance. Conceptually, studies of this nature may never answer the question of dream enactment in RBD unless the confounding aspect of memory during brief awakenings (or dream incorporation, if it exists) can be removed, somehow. Although I can't see how, someone may develop a method in the future.

In a paper from John Peever's lab at the University of Toronto, (Peever and Fuller, 2017) that group agrees with Blumberg`s suggestion that it was motor learning that was relatively underdeveloped at birth, but they disagree and take issue with Blumberg's contention that dream incorporation and not dream enactment is taking place, although Peever having neither rejected dream enactment in RBD nor in lesioned cats, has not offered a justification for his evident belief that cats dream. It will be a fascinating read if he does, and I do not prejudge such an effort. After all, cats may dream! Cats have calls, so they may even have a *forme fruste* HLDs-type dream, where articulation is essential to the signal in the call, but how will they tell the investigator? New imaging techniques may be needed.

Unprovable or unfalsifiable factual assertions must, however, be forever suspect. The absence of evidence for dream enactment, together with the non-falsifiability of the sup-

posed model of dreaming cats also acting out their dreams, appears to make incorporation of dreams, or of memory, a safer conclusion and more likely than dream enactment. Fewer assumptions are needed so either memory or dream incorporation is more likely to be correct (Occam's razor).

4.7.5 Is RBD-associated increase in activity a motor maintenance response to atonia failure?

RBD continues to exist even if dream enactment is judged to be a failed explanation for the observable behaviors. Further study on RBD since 1986 has unearthed new information. In a Spanish study (Iranzo et al., 2009) at the Hospital Clinic, Barcelona, evidence was cited that in a cohort of RBD patients followed over a 5 year period, a measurable increase in activity of the observables occurred. This feature was predictable from Adrian Morrison's study on lesioned cats (Morrison,1983). Morrison was motivated to replicate Jouvet's lesion studies. His cats demonstrated large jumps of activity in observable behavior after surgery compared to before. Morrison counted the increase in locomotion activity in his lesioned cats during RSS over pre-lesion waking activity levels, and found a very substantial increase in the locomotion, a metric of activity level, which was up by as much as 2 ½ times normal levels. Neither Schenck nor Iranzo address Morrison's findings. The finding on lesioned cats of increased activity levels (in the absence of atonia) adds plausibility to the mm explanation for the extremely vigorous movements sometimes seen in RBD cases.

In the 11-patient cohort reported on by Iranzo it is eventually concluded that based on "excessive electromyographic (EMG) Activity", in subjects such as theirs, "there is an underlying progressive pathologic process damaging the brainstem structures…" They think the uptick in EMG activity is from brainstem structures failing more, in structures that are responsible for atonia. The arrow of causality of the increase in EMG can be viewed in the opposite direction. RSS motor maintenance might be increasing its signal strength in an attempt to offset the increase in muscle noise that could be obscuring afferent responses. One can see the increase in EMG as a remedial increase in activity of test or repair by mm programs running during RSS. Absence of atonia during RSS is very likely to have an immediately negative impact on the usual mm signal-noise relationship due to increased muscle noise.

Assuming the increase activity is due to mm, is it protective of the damaged brainstem or a destructive process as Iranzo presumes? It could be protective, and if so, mm activity may explain the decades long delay after RBD before frank onset of Parkinson's disease (PD). I wonder if those with RBD who progress unusually quickly to PD may reveal adverse characteristics or defects in the mm function, or RSS. Perhaps clues already are present in the literature of the early progressors? Morrison's work shows that the increase in activity level is noticeable very soon after atonia fails in lesioned cats.

5. Dream origin (3rd fold)

5.1. Did lithic tool making prompt the first dreams in archaic Homo?

Homo habilis plausibly were the first Homo to use words. Here is a narration for a fable that recounts a meaning-making activity. (One doesn't want a meaning-making narrative feature in a dream report because it obscures the holophrastic meaning.)

At the time of this fable, H. habilis already were using stone as tools for hammers and anvils –the sequence of development that continues down to the present in non-Homo, but they were not yet flaking sharps. H. habilis may have been the first species on this earth to invent lithic core and flake technology. They likely needed words to organize groups into a cottage industry to work a quarry with suitable cores for making the sharps. Note that the boundary between a word and a call is close to arbitrary when the language form is holophrasis, but both words and calls depend on repeatable phonology to be efficacious.

The setting is a camp of H. habilis near the shore of Lake Victoria in modern Tanzania – a famous site discovered by the Leakey's in our times (Mary Leakey 1971; Torre et al 2010). My story recounts an occasion when new calls or words could well have emerged in Olduvai Gorge, some 2 million years ago (Mercader et al, 2021).

To say this shortly, the conjecture is that for creatures with RSS, flaking of sharps as a refinement in stone tool making, lends itself to a communal project and therefore gave rise to the invention of speech, which was used to marshal the workers. Probably this occurred many times over the ages as new species of archaic hominins arose. Motor-mouth theory predicts that the brainstem's motor maintenance (mm) function that runs during RSS will adapt and respond with articulation maintenance and testing, and the BRC may use holophrastic linguistic dreams (HLD-type) as a probe.

In the many eras of geologic time when vertebrates preceded Homo, and before speech (words or a system of calls with specific meanings) began, the brainstem was doing its REM-state work of maintaining all the motor functions. There was no need for articulation maintenance up to then, so there was no adaptive pressure for the development of HLD-type dreams before the beginning of speech.

I imagine the specific occasion when a word was coined and it may have come like this: A member, some prodigy, has invented how to make lithic core and flake sharps from particular stones nearby. They recognize the value of enlarging the work force. I give this person a name, "Ree". Ree shows some sharps to a leader in the clan, perhaps Ree's mother, who sees the value to the clan of these handmade lithic sharps and thinks to herself it would be good if they could make more of them, faster. Ree gets the nod to go-ahead and uses the call to assemble, loudly shouting it out. All within ear-shot gather. The discovery of any new location that was worthy of noting was, by custom, given the generic call, "Qua". Ree points and uses gestures and the Qua call to pantomime a location for a Qua which Ree knows has the good stone, in quantity. When Ree has their attention, Ree leads the way through the bush, running to that place of the abundance of the stone. The group runs after Ree and all soon arrive at the location, at the new Qua. Ree gives the lesson by selecting examples of the best stone for the core, and points to features that identify it. Ree then demonstrates on one promising core by chipping off a number of sharps as butcher blades or spear tips or wood carving blades and distributing them. The clan members present are enthralled and energized by the lesson. Many call out thankfully to Ree for leading them to this Qua. Several begin to shout out; "Qua, Ree; Qua, Ree" and they chant this over and over in jubilation. Everyone is encouraged to mimic the

new call "Qua-Ree", to memorize the very special location of Ree's Qua for the powerful stone.

Soon, if not that very night, during RSS, a person present at the Qua-Ree site suddenly and intensely feels like they are out and about in the real world holding or beholding a stone, and when they awake, the call, "Qua-Ree", is present in their mind. Soon -- although it might have taken decades, but what is that compared to 2 million years ago? – all of those still alive who went to the Qua-Ree site, and later became part of the production effort to make the sharps, have such dreams whereby their REM-state sleep's mm function has added articulation of "Qua-Ree" to its tasks. Perhaps such a dream began more quickly because in this narration it is assumed that some calls already exist, if perhaps not so obviously bound up with such a general benefit to strengthen the community. When the Qua-Ree dreams do start, the dreamers are perhaps frightened or just awe-struck at the intensity of this experience –the hallucinatory sensation we still have of being out and about in the real world which continues to be the singular exemplar of a dream as opposed to a visual thought while abed (Foulkes, et al, 1966) – especially when it becomes apparent that others also are or were already having similar dream experiences during their sleep. In time, everyone in the community is experiencing the dream probes of Qua-Ree, as the significance of the location of the stone for the sharps they have learned to make registers more deeply. The location is passed among clan members and Qua-Ree is taught to the children as the name for the location. It becomes second nature to learn to say it by imitating lip movements and sounds, such that by about age 1 or 2, their youth can articulate words and calls of consistent phonology. The technology of flaking the sharps quickly enriches their diet, transforming it with more meat they can now butcher efficiently, and carry away in smaller chunks, and dry, or even cook over kindling wood cut to usable size by the sharps.

Those in that first group and their children and later descendants, some of who were inclined to what we now call mystical sensations, puzzle over the origin of the dream experience. In the explanation, they invoke theories that over time become replete with spirits, and eventually, with the passing eras, descendants imagine an underworld to house them, all of which are adopted to explain the phenomenon that is occurring in dreams to all members of their society. They are familiar with death. The ideas gathers strength that the dead came alive in dreams – easy to believe because of the hallucinatory sensation of being out and about in the dream, true especially when we encounter dead relatives or dead friends in our dreams. At the same time, for the early adoptees, it is obviously associated with the specific location where the call "Qua-Ree" was learned, as a beneficent place for rock cores, which provides the clan with the stone to flake sharps as tools that make them stronger and greatly more efficient hunters and butchers. The Qua-Ree location becomes a shrine to the clan, the quarry where they obtain the core stones for the sharps that empower their clan.

A religion begins to emerge and the faithful attribute certain dream elements to the power of the shrine, although the dreams images are nothing more than the orthography of speech sounds that will make the word Qua-Ree. It is plucked from the minds of the dreamers as they fall asleep and when they enter RSS their Medulla Oblongata (or other BRC) uses the speech sounds as orthography to form dream images and when they awaken the BRC uses the phonology in the uttered or sub-vocal report on the dream images to assess the motor aspects of articulation.

5.2. The two fundamental observables of HLD-type dreams are resolved

As I collected dreams and puzzled over the two fundamental observables — (1) we use holophrasis in the dream report –the most ancient form of speech, and (2) the dreams' meaning always refer to a *true context*, some current thought — the realizations gradually came to me that the origin of HLD-type dreams might have been a very early adaption monitoring articulation soon after speech began, for how limited is the value of speech or words if they can be articulated any which way? Some process must exist in us to regularly assess and control the output, the articulation, of words, I reasoned. What was needed was a way to maintain the motor aspects of articulation for speech to be maximally effective in transferring information. I gradually came to see the solution to this puzzle as the inevitable constraints arising from these two basic observations about HLD-type dreams: holophrasis and the *true context*.

This fable about H habilis was part of the answer that came to me, intuitively. Could I rely on it? A law school dean taught each incoming class this ancient wisdom: "There is nothing new under the sun." (Clifford H.C. Edwards, b.1924 – d.2008, personal communication 1966). So, I went looking for corroboration that speech and lithic core flaking began together, and I found a precedent. It is attributed to Phillip Tobias, (Tobias, 1991) who is credited with the discovery and naming of H. habilis at Olduvai. Tobias believed that organized tool making coincided with the "invention of language" and "represents a critical stage in the evolution of modern man". He quoted a colleague, saying he would use

> *"…the words of my esteemed friend Björn Kurten, '... at this point new evolutionary vistas are opened. The invention of language and the largescale manufacture of durable stone tools are the starting point for a new kind of evolution in which the cultural evolution becomes inextricably combined with the genetic. ...'" (Tobias, 1991; Kurten, 1984).*

Since this was the beginning of speech, holophrasis, the earliest form of speech, would have been used. This would account for the first of my two fundamental observables of HLD-type dreams.

As to the *true context*, the second fundamental observable in the HLD-type dream experience, for the longest time it was hidden behind my fascination with the use of holophrasis. Eventually, I looked closely at the phenomenon of the *true context*, and the full realization of Motor-mouth theory began to emerge. Learning to speak is based on mimicking speakers and arises through social contact between the teacher and student, as Edward Sapir taught (Sapir, E. 1921). Articulation testing is most trustworthy if it mimics that process. The brainstem tests a word for articulation that we have recently thought with or used in a context of a concern to us at the very time, and that's why we were thinking about that word earlier, as we fall asleep.

The recent usage of the words assessed gives social reliability to the phonology used, and provides assurance that the test results will be reliable. This accounts for the second fundamental observable of HLD-type dreams: the meaning of the test word reflects a *true context* in the dreamer's life

at the time. The meaning often comes in a punny sense of the test word because as a dream image it usually has little or nothing to do with the *true context*. The tested word is susceptible to meaning changes by the taint of any narrative arc in the dream report. The dream images become orthography for the words to be spoken in the dream report but that is aside from meaning, which depends on context.

5.3. Dreamtime, everywhen: Aboriginal beliefs are "grounded in the earth itself".

An age passes. Tectonics move continents to and fro and land bridges open allowing later archaic hominins and early Homo sapiens to scatter out of Africa into other locations including Australia. The early speculations about dreams that emerged with speech became embedded explanations and take on the aspect of revealed truth. Eventually, some 2 million years later, similar ideas appear in rich detail in Roman and Greek mythology. Among the Romans, Somnus is the god of sleep. "He oversees the spirits of dreams and nightmares" (Jordan, 2014). Somnus' abode was in the underworld. In Virgil, Somnus is made the brother of Death. These ideas persist into our times as the nightly insanity of dreams, even as the belief in the existence of these God's fades.

Nowhere did such ideas on spirits and lessons in living survive with greater visibility or vigor then among Australian aboriginal peoples who were not exposed to classical ideas, suggesting an ageless continuity of ideas that originated with archaic hominins. A remarkable aspect of the aboriginal religions in Australia, we are told, is that "these are religions grounded in the earth itself" (Nicholls, 2014). Australia had hundreds of language groups when Europeans first arrived (Nicholls, 2014), but all of them shared the concept that is translated into English as "Dreamtime," that is uttered as the word *Jukurrpa* (Patico, 2021). The translation of it is attributed to an a 19th C. ethnologist, Francis Gillen (Nicholls, 2014; Goddard & Wierzbicka, 2015). Gillen was the stationmaster at Alice Springs. He was of European origin. He became proficient in a local language and was friends and loyal to local aboriginals. His ideas on the Dreamtime reflect one of several forms of similar belief systems among various surviving communities of aboriginals grouped by language in Australia. Gillen was given credit for this usage by Walter Baldwin Spencer who led the Horn Expedition of 1896 into the deserts of northern Australia. Only his account (Spencer & Horn, 1896) of the Expedition survives. (Discordantly, Spencer reveals himself in the Horn report as an anti-aboriginal racist. Everything he said on this subject may be tainted with bias, but this source must do as the only extant account of Gillen's contribution.) Spencer credits Gillen both for the word "Dreamtime" and for the explication of the central aspects of aboriginal belief, which focus on the eternal present. Gillen called this "everywhen". The translation of *Jukurrpa* as "Dreamtime" is more controversial than "everywhen", because modern anthropologists point to many aspects of *Jukurrpa* that are conceptually distinct from prevailing academic views of dreaming. I believe Gillen got it right, and I believe he distilled the explanation from what his aboriginal friends conveyed to him and he was not wrong to reject prevailing 18th and 19th century views of dreaming, which, as I am arguing, are ancient shibboleths and folktales about mental illness – with the benefit of 21st C hindsight, of course.

It is suggestive that the aboriginals of Australia believe that specific locations are holy and life affirming. Nor are they alone in such views: There are examples of similar associations to sacred aspects of the landscape in the Abrahamic religions. Also North America has many sites which carry marks that appear to be holy, made by early aboriginals. That tight bond between the aboriginal Dreamtime and landmarks and locations, is what one could expect. The locations stand for the quarries with valuable sources of stone, which became shrines. Many calls likely were needed for the very promising lithic technology, a life enhancing gift from stones in the ground at a specific location, which justified that location's treatment as a sacristy.

6. Dreams as insanity or as otiosity (4th fold)

6.1. Freud adopted 19th C views that relate dreams to insanity and to the unconscious, and so created "a tumbling ground for whimsies"

If this common type of dream is a probe for assessing articulation, how did our ideas about dreams up to now fail in such an extravagant way? Consider the false belief about insanity in dreams that Sigmund Freud inherited. He sets out the 19th C. received wisdom on dreams (Freud, 1899, 1913 Brill's English translation):

> *… To be sure, the comparison is still older. Radestock begins the chapter dealing with this comparison, by giving a collection of expressions showing the analogy between the dream and insanity. Kant somewhere says: .. The lunatic is a dreamer in the waking state." According to Krauss, "Insanity is a dream with the senses awake." Schopenhauer terms the dream a short insanity, and insanity a long dream. Hagen describes the delirium as dream life which has not been caused by sleep but by disease. Wundt, in the Physiological Psychology, declares: "As a matter of fact we may in the dream ourselves live through almost all symptoms which we meet in the insane asylums."*

To operationalize dreams if they are analogous to insanity, corollaries to insanity were needed, and this was the belief in both an underworld and the unconscious. A decade before Freud's master work was published, William James, (1890), the founder of American psychology, concluded a thoughtful discussion establishing the non-existence of the unconscious, with this caution for those who advocated it,

> *"It is the sovereign means for believing what one likes in psychology and of turning what might become a science into a tumbling ground for whimsies."*

The zeitgeist favored Freud's conception and it took hold. If insanity has been with us since Homo emerged, this contributed to acceptance of Freud's dream theory. He reasoned that free association from dreams was their best use. In one sense his invention of repression theory was inspired. He was able to downplay full-on insanity in dreams, but still support his view that all dreams were bizarre, as they plainly appear to be when dream reports are couched as narratives. So, he taught that dreams contained forbidden wishes from the unconscious that produced the repression of felt conflicts leading to a mild form of insanity, the neurosis, which brought them to his clinic. Artists were intrigued by it and to the present time it still offers golden opportunities – the 2021 version of the Matrix movie is a current block-

buster example that supports the belief in the unconscious. Theorists and practitioners in the fledgling social sciences leaped on the unconscious. Why not? It is a black box for use in endless ways.

Freud's theory of repression was based on the ancient belief in an underworld, where the spirit of the dreamer is subject to depraved wishes if not actual experiences of debauchery. To the extent that this belief underlies the theory of the psychoanalytic enterprise, it enables its curative power in many analysands. It ought not to be gainsaid because the practice of psychoanalysis undoubtedly relieves suffering, and evidence supports the efficacy of Freud's psychodynamic psychotherapy, its modern name (Logie, 2014). A revised academic theory of dreams, incorporating Motor-mouth theory, would not hurt this therapy. A few adjustments in theory and none in practice would be made and it would be psychoanalysis as usual. Freudian-based therapy will not be the first intuition that worked within limits despite the failure of the theory it was based on; viz Newton's theory of gravity, false though it is, works well enough to send rockets to the moon.

6.2. Hobson agreed with Freud that dream content is deranged

The idea of dreams as deranged (neurotic) thinking has reappeared in various disguised forms, although claimed as alternatives to Freud's view in other aspects. One respected modern researcher on dreams, J. Allan Hobson, recently deceased, makes this a central feature in his activation-synthesis theory (Hobson, 1988). Hobson said "The brain is so inexorably bent upon the quest for meaning that it attributes and even creates meaning when there is little or none in the data it is asked to process." One sees that Hobson also views dream content as without intrinsic rational meaning that is, deranged. But HLD-type dreams are intrinsically rational when we see their simple biological structure and purpose and how they fit with the motor maintenance of articulation of speech, and obey the two fundamental observables.

Figure 1. Ella Freeman Sharpe, (1875–1947). Circa 1900 "Brownie" Freeman at age 25. [Later, Ella Sharpe]
© British Psychoanalytical Society (incorporating the Institute of Psychoanalysis.) "Used by kind permission of the British Psychoanalytical Society Archives." https://psychoanalysis.org.uk/our-authors-and-theorists/ella-sharpe

6.3. When Freud abandoned "wish fulfillment" as the impetus for dreams, he offered no replacement

One mystery is what replaced Freud's early conjecture that dreams are wish fulfillment, an idea that he abandoned when he was confronted with recurring PTSD nightmares in victims of the Great War (Freud, 1933). There, he confessed:

> *"The first of these difficulties is presented in the fact that people who have experienced a shock, a severe psychical trauma—such as happened so often during the war and such as affords the basis for traumatic hysteria—are regularly taken back in their dreams into the traumatic situation. According to our hypotheses about the function of dreams this should not occur. What wishful impulse could be satisfied by harking back in this way to this exceedingly distressing traumatic experience? It is hard to guess."*

I believe that those PTSD nightmares are a different type of dreaming when they begin, and are not related to articulation as the HLD-type are, but Freud did not consider that. The PTSD-type dream begins as eidetic memory, a replaying of the trauma. They depend on episodic memory, which appears not to be implicated, at all, in the formation of HLD-type dreams.

It is noteworthy that Freud never offered a new theory of why a dream occurs, or in the case of PTSD, reoccurs. An HLD-type dream almost never reoccurs. Over time, some PTSD nightmares do take up elements of HLD-type scenes against a background of the PTSD-type. That is a different essay.

6.4. Ella Freeman Sharpe, UK Freudian, taught Poetic-Diction, a version of HLDs

Ella Sharpe's ideas on dreams as poetic speech made her an early role model. She came to psychoanalysis first as a patient of Bloomsbury treaters in 1916, suffering grief and anxiety over the deaths in the Great War of close friends and former students at her school for teacher-training in the UK, where she had taught literature (Poetry) and was assistant head. She met Ernest Jones through the treaters, became intrigued with the Freudian process, and Jones, a neurologist by training, by then Freud's leading colleague in the UK and in the English speaking world, got her into a training analysis in Vienna. She qualified and returned to London in 1921 and began to work with Jones, soon to become his director of Education in the Institute of Psychoanalysis where she taught a generation of analysts in training to use, essentially, the Cipher-method on the HLD-type dream, which she called Poetic Diction. Her still very useful book, written in English and published in 1937 based on her lectures (Sharpe, 1937) is the first book on this type of dream since 200 CE (Artimedoros, 134-200), some 1700 years earlier. Over the next 50 years, Sharpe's book fell into relative obscurity even among dream researchers, except for a few scholars. I was referred to it immediately after my 1986 lecture and in time to mention it in my 1987 paper. (Milton Kramer, personal communication, 1986; Arenson, 1987). Although Sharpe approached the meaning of words in dream reports as I do, at the holophrastic linguistic level in the context of the dreamer's life, she was a faithful Freudian. She believed in his repression theory, and had her clients free-associate from their dreams (and she taught her students

how to use free-association, the fundamental technique of the Freudian system).

To a Freudian therapist, the dream's usefulness, in practice, was limited to being the first step outward from the *unconscious*. From there, free association from the dream report was expected to identity that which is repressed, for repression, Freud, Jones and Sharpe believed is the method of defense against the unconscious wish to do something the client considers evil or forbidden. Neuroses are the outlet of the intense anxiety against giving in to such repressed wishes, in Freud's theory. Sharpe's approach did not vary from the Freudian theory as to the existence and origin of neuroses. Sharpe did disagree with Freud in the sense that she paid close attention to the punny utterances in the dream report, and was alive to the puns and plays that were relevant to her patient's life at that time, and only after that did she pursue the free association to the neurosis or at least the repressed wishes that Freud believed, at one time, lies under all dreams. Her recognition of the HLD-type dream is a tribute to her insights and work. I salute her.

A few years after Sharpe joined Jones at the Institute of Psychoanalysis, along came Karin Stephen (nee' Costelloe), a brilliant polymath, first a philosopher then a Cambridge educated physician. I write about Karin Stephen because in 1933 she published perhaps the first book in English on Freud's theory, which she based on her lectures to med students in Cambridge. Her book's provocative title is *Psychoanalysis & Medicine: A Study of the Wish to Fall Ill*. As with the prevailing view of Freudians, repression was the key to the neurosis she diagnosed and treated. When dreams are mentioned by Stephen, it is in association with hallucinations and neurotic symptoms, and she never mentions Ella Sharpe's Poetic Diction although her husband, Adrian Stephen (the youngest brother of author Virginia Woolf) probably learned it from Sharpe when Adrian completed his training in psycho-analysis with Sharpe.

Karin Stephen's reference is to the "curious hallucinations of dreaming". She said they were similar to the "distorted … unfamiliar … and silly" in repressed impulses. She offered that, as well, to explain sleep, which "resembles psychogenic illness" she said (Karen Stephen, 1933 at p.44-45).

> *"Sleep seems to be a normally occurring disturbance of our consciousness which resembles psychogenic illness in that there is a temporary weakening of the barrier which in waking life shuts out the unconscious pretty effectively in healthy people. Even in the healthy the barrier is lowered normally during sleep, so that repressed impulses and unconscious wishes begin to' speak out in the curious hallucinations of dreaming. […] This tendency of unconscious meanings to be expressed in distorted and unfamiliar, and even what we might consider silly, ways helps to make it seem at first sight as if neurotic symptoms and similar things like dreams and slips – had no intelligible meaning at all."*

There it is again, now from Karin Stephen, the settled view of influential early Freudians that a dream represents at least mild insanity unleashed into the unconscious and that can't be escaped, because sleep itself will allow "…psychogenic illness". Also, not a lot different than the view that one can trace back to Australian aboriginal beliefs of the Dreamtime as the continuing present moment, the everywhen.

6.5. Misguided theory may lead to effective treatment, and to better theories

Ella Sharpe may have been unique among Freudians in that she was prepared to hear the holophrastic idioms or a word's punny sense that was also sensible as referring to a current concern or current thought in the dreamer's mind at the time –what I call the *true context*. Her book is replete with them. Sharpe, however, always taught her training class that they should encouraging free association using the dream report as a stepping stone down into the depths of the unconscious, (to the domain of the everywhen, we can say).

I feel grudging gratitude for Freud's dream work, and not only for recognizing the genius in Ella Sharpe which lead to her great work using a Cipher-method focus on holophrasis in dream reports. His work bridged the gap from disdain for dreams as insane raving to Sharpe's view, and his clever ideas helped sustain the scientific study of dreams in the early years of the 20th Century. Some workers wanted to support his theory, but some because they doubted it.

I repeatedly cite David Foulkes for the key tell of the hallucinoid dream experience where the dreamer feels like she "is out and about in the real world" (Foulkes et al. 1966). Foulkes' purpose in this classic 1966 study was to refute Freud, to test and establish, if he could, (and he believed he did) that not all dreams were bizarre, only some 80-85%, contrary to what Freud believed! Foulkes belief was relayed to me by Harry T. Hunt then the editor of *Dreaming*. (*Dreaming* is a peer-reviewed academic journal published by the American Psychological Association on behalf of the International Association for the Study of Dreams.) Hunt was told this by Foulkes at the time (Hunt, 2016, personal communication). I'm inclined to Freud's view on this point: HLD-type dream reports will all come out bizarre if the report is presented in a narrative form as it routinely was, and the narration connects the dream's scenes from one to the next. Also, of course, not all dreams are HLD-type (Hunt, 1989).

6.6. Some of Dement's ideas endured, others were wrong but revealing

Charles W. Dement was aware of the stigma attached to dream research as a graduate student in 1950. He was the junior member of the team that discovered REM-state sleep. He had a psychiatric background and was one graduate-year class behind Aserinsky in 1953, when RSS was discovered at the University of Chicago under Nathaniel Kleitman, who then was considered the "father of modern sleep research."(Brown, C. 2003). The three of them never agreed on the significance of their discovery. Only Dement thought that the dream connection was the key discovery. Kleitman doubted that dreams were due to REM-state. They did not get a dream report in ¼ of the awakenings during REM-state (Aserinsky & Kleitman, 1953). (This may be because dreaming does not necessarily occur during ocular quiescence although RSS continues according to the EEG.) Aserinsky said his appreciation of a connection from RSS to dreams came slowly. He never accepted that infants in RSS were dreaming. (If infants do dream during RSS, this will be the 8th type of dream.)

In a quote attributed to Dement, we are told that

> *"Dreaming permits each and every one of us to be quietly and safely insane every night of our lives."*

So here it is again, the insanity bromide, from one who was a grad student in the lab that discovered RSS. As we saw, it was the prevailing opinion that Freud found in 1899. It was an ancient belief but how is it adaptive? It is curve fitting to ancient mythology equating an underworld with sleep and death and dreams and insanity, not a considered analysis of the facts. Dement may have been tongue-in-cheek. This opinion of Dement, if it was sincere, is evidence of another outbreak of otiosity that still occurs in modern scientific dream theory when it purports to develop old dream ideas in new directions.

Dement must be credited, however, with the classic study of the REM drive (Dement, 1960). Subjects were awakened over seven nights every time they began REM (which Dement presumed would mark the onset of a dream). At least, that was the plan. The drive to dream –as he interpreted what was occurring – was so strong that in the end Dement calculated that the experimenters achieved only some "65 to 75-percent deprivation". They found "a progressive increase in the number of attempts to dream". He established the usual component of REM-state sleep at some 20% of a night's sleep, but in his dream deprived group, when they were allowed to recover, this jumped by half to 29% until dropping back to 20%. No explanation of the RSS drive has gained consensus. The dream drive is evidence of the biological urgency of the REM-state and therefore one must admit it may point to something essential about that process, which under Motor-mouth theory should include motor maintenance of the entire neuraxis, and it also will include dreams. Dement's RSS drive is perfectly consistent with this theory of HLD-type dreams as an essential probe by the medulla for the motor maintenance of articulation, as opposed to some fanciful atavistic desire for insanity every night.

Not everything else Dement said in this 1960 report has survived further investigation. He was wrong in his claim that the eye ball movements during REM "represent scanning movements made by the dreamer as he watches the events of the dream". This is not so for HLD-type dreams at least because they are conceptual. HLD-type dreams can be resolved at the linguistic level by holophrasis and the *true context* test. The language element in itself strongly suggests that dreams are conceptual and not perceptual. This conclusion is also reached by Kerr, Foulkes *et al*, in their 1982 paper following a different path, the quest for whether dreams are inherently visual. They conclude: "(T)he dream is a constructive cognitive process, rather than a reproductive perceptual one…" (Kerr et al, 1982). Cipher-method's language machinery works because the (conceptual) images in a dream are embedded speech sounds. The dream images are a kind of orthography for the words to be spoken in the dream report. Orthography -> phonology, from dream image to the vocal or sub-vocal report, is the last step before the brainstem can assess articulation of a test word.

Isabelle Arnulf's group at the Pierre and Marie Curie University struggled for almost a decade attempting to make the case for dreams as percepts, before stepping up and accepting their inability to contradict the conceptual nature (Arnulf, 2011; Arnulf, 2012; Arnulf, 2019). Observations on lesioned cats contributed to confounding the conjecture that s-REMs are to provide a dream experience of cortical vision. Blumberg's group notes that, "…cats with lesions of the visual cortex continue to exhibit REMs", (Blumberg 2016). In this 2016 paper, Blumberg and colleagues concludes that: "…REMs are not generated in response to activity in visual cortex".

6.7. Content analysis: the fallacy of a narrative arc often makes assigning reported words to categories a doubtful farce

The Continuity Hypothesis in the Content Analysis project of Calvin Hall & Robert Van de Castle was used to categorize words in dream reports. It seemed otiose, based as it is on the use of narrative dream reporting because narration is a meaning-making activity that obscures the true holophrastic sense and *true context* in HLD-type dreams.

Hall proclaimed the Continuity Hypothesis, and he and Robert Van de Castle set about developing a system that purported to show that dream reports taken as long-form narratives (ignoring holophrasis and Cipher-method), are not puns or plays as often appears in Cipher-method using holophrasis, or in Sharpe's Poetic Diction, but are explicitly about matters that reflect the dreamers' waking thoughts. Van de Castle tells us that Hall made this claim of continuity by using the very words in the dream report (Van de Castle, 1994, at p. 303). This may sound like my *"true context"* – what was on the dreamer's mind at the time. But there is a hidden assumption in Hall's approach that a narrative arc exists. Van de Castle wrote that Hall made the "…assumption that the frequency of occurrence of a dream element or theme directly represented the dreamer's preoccupation with that topic in waking life."

It's not that I would disagree in the abstract with this notion of the Continuity Hypothesis if they bothered to ask the dreamer what she meant. But they never do. It is more puzzling because Hall and Van de Castle choose not to discuss with the dreamer what her words mean and they (erroneously) presume that dream reports have a narrative arc that provides the necessary context for meanings, and that the researcher may rely on that to assign a meaning to the words used, and that will dictate what the correct category is for the words used. In our modern cultures, and my guess is that this is worldwide, there is an ancient folk assumption that dreams are to be told as stories, which means they are naively given a narrative arc in their telling. (This observation is mine, but it could be made the subject of an investigation.) Hall and Van de Castle cannot hide behind a common misunderstanding that allows the dreamer to confabulate a context that creates a potentially false narrative arc.

There is a deeper reason for the narrative fail in the dream reports collected by Hall & Van de Castle: it is the absence of "clock-two" in dream reports. Narratologists, who study literary theory, observe that there are two clocks running in a true narrative report or story. Clock-one tracks the order in which the author presents the plot to the reader. This gives rise to the "uttered world". Frequently, an author presents events out of their chronological order, but with clues to their correct order. Clock-two uses the clues that allow the reader to re-arrange the events in the uttered world into their chronological order (Torrence, 2013). But, in dreams there is only clock-one, and scenes are often, (usually if not always), disconnected from one scene to the next making the true chronology of what came first in the dream's uttered world, uncertain, with no clock-two. There are never (or rarely if ever) clues that allow us to re-order the events in a true chain that the author of a narrative in the dream would presumably intend, if the dream was in fact a nar-

rative. Without clock-two, no narrative arc can be inferred that connects the scenes. In Cipher-method, a new scene signals a new thought. It may be related, because the *true context* may have carried forward in the dreamers thoughts upon falling asleep, but it may be some other matter that is on her mind.

Hall did some therapy. In his book he alludes to some of the language and ideas of Freud, without specifically citing him. Hall asserts that dreams "tap the unconscious", of the Freudian kind, but this is not made clear by any specific discussion or explanation of what the unconscious means in his context of Content Analysis. His use of the unconscious may mean that it is one that originates and lingers from a childhood experience, because he makes this claim (without evidence),

> *"…prototypic conceptions have their origin in early life and that they are more likely to express themselves in dreams than through any other medium"*

Hall's most prominent 20th and 21st century followers do dream research and not Hallian-therapy (if there is such a thing).

This ongoing body of research constitutes the present received wisdom in dream science. Some useful insights have emerged. We do gain interesting demographic information from certain of these researchers. There are those who assemble online information from thousands of dreamers, but, because the context of words used in the dream report to the dreamers' life are ignored, in some cases this introduces uncertainty in results that depend on one of alternative meanings of words used in those dream report. Michael Schredl has pioneered such massive studies on dreams while looking for gender differences. In one large meta-analysis with an N of 2892, of which women number about 2/3, mean age 34.2 ±13 years, these researchers found no gender difference in frequency of dreams the subject considered bizarre (Schredl, et al., 2010). What one considers bizarre may well be context dependent on gender, I would argue. If a man dreams of giving birth, it would be bizarre, unless it was a metaphoric reference to the birth of an idea, but how does the researcher know that unless the dreamer is questioned? In another series of related studies, Dr. Schredl did find that woman significantly more frequently than men reported nightmares (Schredl & Reinhard, 2011). This study on nightmare frequency between the genders is unlikely to be influenced by lack of contextual information on words asserting or denying nightmares. The sample size in these studies is so large, over 40,000 subjects [with about 60% women], that high statistical significance is usually achieved if there is a true difference, even if it is tiny. The Cohen effect size here of 0.26 is small but not trivial. I take it as proven that nightmares occur somewhat more frequently in women than in men. In another study, also where lack of context was unlikely to skew results, Schredl did find that women recalled dreams more frequently than men and this had an effect size of 0.5 (Schredl, 2016), an effect size that Cohen describes as "palpable". For researchers, like me, who collect dreams in the wild, this study was very useful and produced valuable information that made my dream collection efforts more fruitful.

Hall's dream theory is otiose and is vulnerable to bizarreness in dreams when it treats dream reports as having an implicit narrative arc, where no narrative exists if the dream was told using holophrastic.

6.8. Bizarreness is fatal to Hall's implementation of Content Analysis

If there is virtue to be found in the Content Analysis route to dream meaning, bizarreness is the undoing of Hall's version of this theory. He urges us to concoct a connected story usually out of unrelated dream scenes and events that unlike waking life usually suffer abrupt disruptions in the relationship between events, or in the normal flow of events, or the sudden appearance/disappearance of events, and all these poorly mimic life.

The clearest definition of bizarreness is a dream with any of these three features (Revonsuo and Salmivalli 1995):

(1) Incongruity (an element inconsistent with waking reality);
(2) Vagueness (an obscure or indeterminate element); and
(3) Discontinuity (an element suddenly appearing, disappearing or transformed).

One or more of these features commonly occurs in narrative reports of one-after-another dream scenes, and any one of these features contradicts the existence of a narrative arc linking scenes. Hall's theoretical approach imposes the narrative context, and here is the pit fall: Context controls the meaning of the words used. Hall can assign the words to neat categories, but doing so relies on a willful blindness to the fact that words have many meaning and meanings change seamlessly if the context changes, and so would the categories they belong to. This is the central source of error in Hall's search for statistics in the words used in dream reports. Dream reports are dependent on words to pass along the meaning. The position taken in this essay is that context for the meaning of words in reports of the HLD-type, is dependent on the concerns the dreamer has at the time. That is the "*true context*" and this context is wholly ignored in Hall's theory. Hall never asks the dreamer about their life or concerns at the time. Notice that meaning is usually independent of articulation, so the medulla's (or BRC's) articulation maintenance function is independent of the rightness or wrongness of Hall's approach to dreams.

Other dream researchers in these times did develop their own content categories that gave useful results. In several labs approaches were developed that protected against the fallacy of the non-existent but presumed narrative arc in Hall's scheme. The Revonsuo lab is one (Revonsuo & Salmivalli, 1995; Revonsuo, 2000; Revonsuo et al. 2015). Revonsuo's Threat Simulation Theory (Revonsuo, 2000, at 877-901; Revonsuo 2000, at 1063-1082; Valli, et al, 2012; Revonsuo, et al, 2015) focused on dreamers under threat, and this threat establishes the likely context of the words in their dream reports and this provided assurance that the *true context* is guiding the Content Analysis category selections. I also rely on their three rules that identify the bizarreness of adult dream reports when treated as narratives (mentioned 2 paragraphs above). The bizarreness produced by allowing a series of dream scenes to be reported as if they had a continuous context shines a powerful spotlight on the misuse of context in Content Analysis.

Hall's ultimate goal was to count the words, which allows various statistics to be calculated. Hall hoped his approach would realize what he thought was Freud's ambition of a numerical science of dreams, as Hall said several times (Hall, 1953, 1966). Motor-mouth theory of HLD-type dreams as motor maintenance of articulation has a place for the Revonsuo group's version of Content Analysis.

7. Related phenomena in learning tunes and in animal models (5th fold)

7.1. Is proof of concept occurring in a study of humans learning tunes in NREM sleep?

An example exists of a related adaptive function in the Antony study (Antony et al 2012). It is a study of music learning skills audibly reinforced during NREM or slow wave sleep. Dreams do occur in NREM sleep (Siclari et al, 2017). Others studying NREM also found motor improvements for specific behaviors – like music learning. Hobson's group found NREM sleep-dependent motor skill improvement (Walker et al 2002). This work of Antony may contribute to proof of concept of the Motor-mouth theory, as suggested by Donald Kuiken, whose dream research, especially on metaphor, cited my work on HLD-type dreams (Kuiken et.al, 2001). On the Antony study, he notes the connection between musical learning and the biologically more important application that targets articulation of speech, and he ranks them (Kuiken, Personal Communication, 2021), "The phenomenon documented in this paper (*ed. the Antony paper*) could be an evolutionary spandrel, while the primary adaptive function resides in speech articulation. Nonetheless, tacit memory for 'melodic' sequence seems sufficiently like memory for the 'musicality' of speech to help explain the phenomena you document."

7.2. Japanese macaques first handled stones for fun but by 2014, within ~30 years, were using them to crack the shells of shell-fish to get at the meat.

Animal models support Motor-mouth theory; especially my premise here that speech provides priceless value to any species that develops it, therefore articulation maintenance is always a pampered adaption to maximize the benefit of speech. If dreams cause problems, articulation maintenance is worth it! (Certainly the consequences of using dreams for articulation maintenance have bedeviled all of us in the household of H. Sapiens.) What is not clear is whether non-human creatures with early forms of speech also dream.

Among the Macaque, as for H. habilis in my fable, it apparently began with stones. Some Macaque monkeys, as juveniles, seem to have taught themselves to play with stones. The behavior involves "the collecting, scattering, or carrying of stones" (Huffman, 1984). This was first observed in 1979, by Huffman, in a provisioned troop of Macaca fuscata, (aka "snow monkey) native to Japan, which country provided their sustenance.

By about 2014, Macaca fuscata in Thailand, also a provisioned troop of less than 100 individuals, were observed breaking open shell fish using stones with considerable sophistication (Tan, 2017). Usually, they set the prey on a stone anvil and then they break the shells with a stone hammer or pick, and all is done with enough precision to access the meat while not pulverizing the shell into an inedible mixture of shell and meat. As provisioned troops, the shell-fish were not essential for food. Tan says that Macaca fuscata mature quickly compared to H sapiens. Tan suggests it was older monkeys, over 3 ½ years of age, who achieved the manual dexterity needed for this, so younger monkeys, like those who played with the stones in 1979, or the children of that generation, grew up by late 2013 or 2014 and turned the stones into tools in Tan's study.

This is still a crucial step short of flaking sharps from the core or anvil, but measured against geologic time, the 30 years or so, from using them as toys to using them to butcher a food source, are an eye-blink, and that is illustrative of my conjecture of how quickly the brainstem may have adapted to the need for articulation maintenance by developing HLD-type dreams when words began.

7.3. Japanese macaques also coined local calls to announce the arrival of provisioners with victuals: vocal learning

Vocal learning studies in non-humans intersect my conjecture that HLD-type dreams represent an essential part of motor maintenance of articulation in Homo. Vocal learning "… is defined as production learning in the vocal domain. (Janik et al, 2000).

In the classic study of vocal learning (Green, 1975), it was shown that 3 provisioned troops of the Macaca fuscata, geographically isolated from each other on Japanese islands, each developed its meal call, which was used by about half (~50 odd) of the members of each troop. Moreover, each troop coined a call unique to its members that announced the arrival of the provisioners with supplies of food.

7.4. Macaque process both human speech and monkey calls in the STG

In 2012, a functional MRI study compared processing of vocalizations in Macaque held in an Oregon facility and in free-ranging Oregon humans (but perhaps they were indentured grad students). The subjects were presented with the identical sound to compare the involved cortical networks. They found (Joly et al, 2012), "At the first stages of auditory processing, both species showed similar fMRI activity maps within and around the lateral sulcus (the Sylvian fissure in humans). Monkeys showed remarkably similar responses to monkey calls and to human vocal sounds (speech or otherwise), mainly in the lateral sulcus and the adjacent superior temporal gyrus (STG)".

7.5. Other creatures with this capacity for vocal learning were soon identified.

A bottlenose dolphin was taught to mimic a whistle sound generated by computer, which was unlike any of their few stereotyped sound forms occurring to that time (Richards et al, 1984). These workers reported that "New models, not heard previously, could be mimicked immediately, often with good fidelity, including mimicry of amplitude variation that had not been explicitly reinforced during training." Two sounds were then taught in association with two shapes: "… (a ball or a hoop) so that, in effect, the dolphin gave unique vocal labels to those objects."

7.6. Vocal production to "name" individuals has been observed in mammals other than humans and may imply dreaming

The next step up in complexity from vocal learning is called "vocal production". It is defined as occurring when the creature has learned from experience with its peers to modify its signal to provide for recognition of individuals and "the negotiation of social relationships" (Janik, 2014). In addi-

tion to H. sapiens and monkeys, the learning of vocal production is spreading. By 2014, it was reported as occurring in cetaceans, bats, pinnipeds (walrus, sea lion or seal) and elephants (Janik, 2014). Vocal learning involving vocal production, as described in these mammals, implies some mechanism of articulation maintenance as we see in H sapiens with the use of HLD-type dreams. Is it significant that whales and elephants and also the pinnipeds, have atypical patterns of RSS compared to H sapiens? Do Macaca fuscata plus these creatures dream during RSS?

7.7. The Siclari method of dream detection applied to non-humans

In Giulio Tononi's lab at University of Wisconsin in 2017, Francesca Siclari led a group that detected the EEG signal of dreaming as a decrease in low frequency oscillations in a posterior cortical hot zone (Siclari et al, 2017). That decrease of slow wave activity was their key observation: "This decrease was restricted to a bilateral parieto-occipital region, encompassing the medial and lateral occipital lobe and extending superiorly to the precuneus and posterior cingulate gyrus." These are specific H. sapiens structures that may or may not have analogues in the brains of cetaceans, bats, pinnipeds and elephants. If they do, could a study using the Siclari method detect presumptive evidence of dreams in these species?

Postscript: "Will I get the bug?" A Sapir–Whorf event

I worked on this paper while COVID-19 rages about us. In the US dream literature recently there are reports of an increase in dreams about bugs – worrying dreams about avoiding bugs or catching bugs. Applying Motor-mouth theory to these dreams, "avoiding a bug" or "catching a bug", which are idioms in English, probably often refers to infections with the COVID-19 "bug". So, if Motor-mouth theory is correct, one expects that such dreams will occur with increased frequency in English speaking lands.

On the other hand, where German is the dominant language there are no reports of any increase in dreams about bugs. In this context, it is striking that there is no idiom in German that uses any word meaning "bug", as it exists in English, to mean getting the flu or COVID-19. Germans are of course experiencing the pandemic, but "catching the bug" is not a holophrastic idiom for catching a COVID infection in German. So, one would expect that Germans are not suddenly dreaming about bugs, and the evidence so far, strongly suggests that they are not. (Dr. B. Holzinger, personal communication, 2021).

HLD-type dream reports are based in holophrastic idiomatic expressions in the local language. This is consistent with the Sapir–Whorf hypothesis, attributed to Linguists Benjamin Lee Whorf and Edward Sapir who were colleagues early in the 20th C. They are said to have posited that the words in your language will influence what you think (or dream) about in your linguistic thinking, as we see here about "bug" dreams and their absence in German speakers.

Note

This is a theoretical essay not a research report. No human or animal research mentioned was performed in preparation of this work. Dream reports discussed are in the public domain or consent was obtained. No funding was received. I declare there are no conflicting interests.

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This manuscript contains terms and ideas that have been partially published among several blog posts at Wordpress.com, in my blog "Dreams the Cipher Method", https://dreamstheciphermethod.wordpress.com/2017/07/10/first-blog-post/

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