REM dreams as a wake state but chained by atonia

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Summary. Rapid Eye Movement (REM) dream science seems to allow its investigators to ignore circumstances where REM could be identified as a wake state. In section 2, the behaviors observed in three recent investigations during REM are suggestive of wake but wake was not mentioned to explain the behaviors. Otherwise excellent studies by these research teams occurred in circumstances where wake was a plausible explanation, and may have been the best explanation. In drafting section 3, where I need recourse to Kuhn and Fleck, I was reminded of my former legal work for injury claimants with PTSD. I commonly saw improvement in pain and PTSD when nightmares of the accident were reduced. Achieving fewer nightmares sometimes seemed to be wilful acts, or wished for. If dreams are an ancient wake function where we are held immobile by atonia, a nightmare reduction might occur by intention, as if nightmares are still a wake function. I recalled these events when I read about studies in the Sleep Lab at Technion, where Holocaust survivors were somehow able to suppress their dreams during REM-W, as if they were wake thoughts. Reduced nightmares may for some be a voluntary wake act while in REM. Fascinating work by Rial et al delves into the chain of wake, sleep, bask, wake, from chordates through reptiles to mammals, in section 6. Take note that "words" are frequent objects of comment in this essay. My overall analysis links features of dream science to a discovery by Tsai et al (2021), which I came upon in 2024. In mouse lungs they found more Red Blood Cells (RBC) are oxygenated (O2) during Rapid Eye Movement (REM), while equal but fewer RBC are supplied with O2 during Slow Wave Sleep & Wake.

Keywords: "Wæcnan", from old English"to wake up; to come into being"

1. Tsai et al (2021) findings may point to conditions in chordates near the origin of the REM-W state

This will be the third in my series of essays, (Arenson, 2022) (Arenson, 2023) which proposes that the origin of dreams was to shape articulation of words when words became essential in community work activity of H habilis. My name for the dream type is the Holophrastic Linguistic Dream, (HLD type). This idea was given the overall name, "Motor-mouth Theory" (MMT).

This essay depends on several assumptions. The first is that the Tsai et al condition originated in an early era of our most likely ancestor species, the Chordates. If REM and Slow Wave Sleep (SWS) both were then states of sleep, this raises a presumption that REM was always and therefore is only sleep, but I dispute this duality of sleep states. More on this, below.

My second assumption is that there was no obvious need among Chordates for REM to appear as another type of sleep, but there was a need for maintenance of newly added motor functions, which, I propose, was the original function of REM. This led to atonia during REM that reduces predation risks. If REM did not begin as sleep, it may have been an ancient form of wake. Also, wake is clearly more convivial to the maintenance task. My main question now emerges: Is REM a form of wake?

In my first (2022) essay I proposed that H. habilis needed words to teach and facilitate the extraction and manufacture of Oldowan and Acheulean flaked lithic (stone) tools (Leakey, M. 1976) that was then underway in the H. habilis encampment, as reported variously, including by Mary Leakey (1913-1996) and by University of Missouri Museum of Anthropology (Ellsworth, 2008).

In my two earlier essays in this series, I treated REM in the conventional manner as a form of sleep. Now I treat REM as a form of wake. I wanted a new word to express this new point. I selected, "*Wæcnan*", from old English. It means "to wake up; to come into being" (Glosbe Dictionary, Oct. 21, 2023). Note the use of the "ae" combined as one letter. This old/new letter "æ" is the "ash", (Wiki, Latin-script ligature), pronounced as the "a" in wack. The first syllable of *Wæcnan* ends in the hard 'c', ("Wack'-nan"). I re-use the abbreviation REM but add the W for that old English Wæcnan making the full name REM-Wæcnan, or REM-W as the short form. I also coined two related words, *wæc*, or *awæc*, which read and sound more like modern English in some sentences. REM-W might equally be spoken aloud as "REM-Wake", its literal meaning.

In my first (2022) essay in this recent series I proposed that REM maintains and runs the motor system now, and in early homo, before becoming associated with words needed by H habilis. That essay gives useful details on background matters, some not mentioned or only lightly touched on in this essay.

I rely on new insights here, but also an essential underpinning of this essay are the longstanding discoveries on the content of REM dreams by David Foulkes in 1966, along with Sergio Molinari in 1969 (Foulkes et al, 1966) (Foulkes & Molinari, 1969). Those papers demonstrate that we often experience a sensation of wakefulness during a dream, while we are in the Tonic state of REM-W. The "Tonic" state is one of the two REM sub-states. The other is named the "Phasic" state. The Tonic state refers to the state that does not have the sequences of rapid eye movements during REM-W but this is when we usually are experiencing dreams. So,

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the tonic state typically will accompany dreams. In contrast, the Phasic state, refers to the state which has those rapidly jerking eye ball movements that Aserinsky saw in 1953, and that is often mentioned, but the phasic state is not associated with experiences of dream sequences.

Both tonic and phasic states of REM appear the same on the EEG, because the EEG does not itself record eye movements. I propose that this sensation of being awake during tonic REM is not a delusion –as confirmed by the aforementioned 1966 experiment-- it is just a different setting for the wake sensation. Usually, we are chained in place by atonia during the wake period of REM-W dreams. The atonia, obviously, does not prevent our dream from including great activity. The 1966 experiment of Foulkes et al found that some 75% of us experience subjective wakefulness during dreaming. In the dream it feels like a wake experience, although we are imagining reality in reference to what we see, hear and do in the dream. In my experience, the content of the dreams usually (often? always?) involve and begin with words on your mind at that time in your life, and the words are the trigger.

In the dream we create a play on words recently used. I was friends with two brothers named Carr. They both have died, younger than expected. I picture them alive as I think of them. Last night I dreamed of two fine automobiles that I was looking after. They both had stopped working in the dream, which seemed to involve me having no clue how to get them running again. ("cars"? "looking"? "after"?). Puns and double entendre are the sinews and bones of dream reports. These are the HLD-type dream discussed in my 2022 essay. Many early examples are in my seminar talk at Ottawa's Carleton University, at a meeting of dream researchers, who were to become the International Association for the Study of Dreams, soon after (Arenson, 1987). That talk was before the full development of the HLD-type theory, but the play on words in dreams of mine, and others, was my theme that day. This feature had dawned on me, and then became obvious, from the beginning of my dream collection at an early age. (I was about 8 y.o. when I first "saw the light" that connected words on my mind to dream visuals.)

Before we were able to dream using words, we needed words. For a detailed theoretical proposal on "How the Brain Got Language" see (Arbib, et al. 2020). My approach in my 2022 essay was to discuss the role of dream reports in pronunciation of words invented to assist the development of lithic core and flake technology. It treats a major drive in the origin of words as a vocal substitution for gestures as to how to create the cores and then flake the sharps. In Motor-Mouth theory, dreams arose to shape the way a word is spoken that reflected a community standard at any given time or place. It is this feature of commonality of how a word is spoken, provided by dreams, which allows words to communicate information in a given community. This remains the role of dreams of the Holophrastic, Linguistic, Dream type, (HLD-type), as presented in my 2022 essay.

The HLD-type dreams bring along a sensation of reality to a REM-W tonic dream, a reality which feels like wake. Why do we have this dream experience that includes a sensation of wakefulness? In the case of tonic dreams, it is usually a play on words in your thoughts at the time. As we age and develop our vocabulary of words, we have less need to assure their pronunciation as used in our community, but dreams with this appearance still occur regularly: Out of habit? As reminders? As a fixed feature in case a new word is introduced? I am not sure why.

Old ideas from philosophy can remain useful. Baruch Spinoza (1632-1677), a Netherlands lens grinder and philosopher is credited with this: Once anything exists it tends to continue existing. Spinoza proffered this as a concept of endurance – a striving for the continuation of existence, for both things alive and not alive. He gave this feature a Latin name, *conatus*, usually translated as "striving" although that translation in English is awkward when referring to what is not alive. Does a rock strive to endure as it is kicked around? I prefer an English synonym, "moil", as in "clouds moiling in the wind". A rock can be moiled around. Using "moil" one can phonologically accommodate things alive and not alive that display *conatus*.

Post-Traumatic Stress Disorder (PTSD), including nightmares, was common among my injured legal clients. If they saw the injurious event about to occur, often they experienced a strong dose of terror, and suffered with nightmares. No nightmares are a significant benefit that accrues to some of those accident victims who come "awake" while in REM. Studies on holocaust survivors reveal a subset who seemed to have escaped nightmares despite horrific abuse. They were studied in the lab of Professor Peretz Lavie and are discussed in more detail in this essay toward the end of section "C" and again in "E". Moreover, recently, Addy Pross, a professor of chemistry, took us through the astonishing next step by proposing a route to life for not-living matter. Some observers, who ought to know, believe he has proved such a theory. The name Prof. Pross gives for this is "Dynamic Kinetic Stability". He calls it "a bridge between chemistry to biology". See section "E" for more discussion of these ideas. Spinoza's "*Conatus*" translated as striving, may turn out be accurate, after all, if non-living matter has a route to life.

The work on the sleep and wake of reptiles by Rial (Rial et al 1993), (Rial et al 2010), (Rial et al. 2022) is important for a key element underpinning this essay: From where did wake arise in mammals? Rial's ideas are set out in section "F", and I accept them.

With this introduction in hand, the proximate cause of this essay can now be addressed: One finds a reluctance to see wake by researchers studying REM. I discuss what three groups saw as "sleep" in their results that could well have been considered as wake. Indeed, my thesis is that judged impartially, what they saw is clearly more like wake than sleep. These are three, clever, modern, studies, each of them centered on REM behaviors. Why were the results not even considered as wake events? Does a designation of sleep in all three not seem doubtful? I discuss them individually in section B. In these studies, the researchers could have fairly claimed, or at least mentioned the possibility, that their subjects were behaving as if awake, but none did so. I was struck by this total absence. I was led to the philosophy of Thomas S. Kuhn (1922-1996) and Ludwik Fleck (1896-1961) to help me understand their reluctance.

The antiquity of our wake state is not a subject often considered. I argue it occurred at least as soon as the onset of motor systems in our aquatic Chordate ancestors, which likely need wake during maintenance. Such a wake state would become a characteristic feature in Chordate descendants with motor systems. By our times, REM-W has been passed down from aquatic creatures through the reptiles to mammals including H. sapiens, arguably always as a form of wake. I contend this is consistent with the findings of Rial

(see section 6 below).

In my essay no. 1 of this series (Arenson, 2022) I composed a parable based in an era of early Homo, (H. habilis), where we have archeological evidence (Leakey, 1976) that shows the local community in an encampment near the south shore of Lake Victoria in Africa, who developed lithic core stone sharps. I propose that REM had by then evolved into the present (faux) sleep-state enforced by atonia. REM continued to maintain motor operations, and also developed dreams for this community to assist in the rapidly developing vocabulary of words used in their mining operations to produce the stone blanks from which they chipped the sharps. Motor-mouth theory proposes that dreams came into existence in order to create a community-wide consensus on how one articulates a given word using mouth muscles and breathing muscles; a motor operation. This remains dream's function in our times, under Motor-mouth theory. We dream to prepare to stimulate a few words when we wake, and we recount them when telling ourself (or others) the dream. Noting that the motor capacity of the mouth is essential to articulation, led me to the name, "Motor Mouth theory" (MMT). REM-W dreams facilitate the sharing of words and how they are pronounced to make them useable for communication when dreams are reported in the community of residence, at any given time.

Oddly, the progress of dream science was both developed and left hanging, in my view, by the 1953 announcement of the discovery of REM sleep (Aserinsky & Kleitman (1953). Their publication included a copy of the EEG from one subject, where it showed the tracing signal from the "RF" (Right Frontal) region, and perhaps thinking it was obvious, there was no mention that this REM tracing on EEG appears similar to a wake tracing. This parallel between the appearance of REM on EEG and wake has now come to be an established and well recognized reality of the EEG of REM-W, and underlies the thesis of this essay.

I note an earlier discovery of REM in infants, before Prof. Kleitman's REM in adults had been found. In infants it was named "Active Sleep" by Russian investigators (MP Denisova & NL Figurin, 1926). This history recently was featured in the journal Sleep (Denisova, 2023, 1st & 2nd) by Prof. K Denisova (no relationship to MP Denisova). The 1926 report came at a time when the EEG was under development, but not yet in use, so there was no EEG record from the 1926 study. Prof. Kleitman did take the opportunity to announce and publish the 1953 EEG tracing, and that was important, novel, information. To my eyes, a laymen's vision, the tracing of "REM" looked very similar to wake. I have never encountered experts who dispute this. The opposite, as will be mentioned.

In a recent five-year period (2016-2021) the three research groups mentioned above, had uncovered evidence that could be taken as wake during REM-W. (See section "B".) Although consistent with a waking state, the three groups let this appearance pass without acknowledging the possible presence of wake. Ludwik Fleck (1935) anticipated such self-induced blindness to emerging scientific facts and alerted us that this risk cannot be removed from the practice of science. Thomas Kuhn (1962) agreed. I will refer to the remarks of Kuhn and Fleck in section C.

REM-W as a form of atavistic wake could explain the results in the three studies to be presented in section 2, in this order: Contextual memory consolidation during REM-W (Boyce et al, 2016); Auditory language awareness during REM-W plus lucidity, (Konkoly et al, 2021); Wake-like breathing behavior during REM-W (Oudiette et al, 2018). I refer to them collectively as BKO.

These behaviors were investigated during REM-W. Each such behavior would not be abnormal during wake. Throughout one's reading of this essay, bear in mind the proof that most dreamers (some 75%) believe they are awake during a REM-W dream experience (Foulkes et al, 1966) until they found themselves awake and in bed in the sleep lab!

2. Three BKO reports that have achieved consensus for discovery of REM functions also have obvious features of wake.

2.1. Boyce et al (2016) could be seeing recapitulation of the ancient form of the REM-*Wæcnan* state that produces contextual memory consolidation in mice (and in H sapiens?)

Boyce et al, (2016), did experiments on mice, as did Tsai et al. The Boyce et al work demonstrates the importance of contextual memory that can be influenced during REM-W. They rely on optogenetics, which is a technique where light-sensitive proteins are introduced into specific brain cells to monitor and control their activity precisely, using light signals. They show that if certain neuronal activity of MSGABA neurons is optogenetically silenced during REM-W -- when it normally occurs -- then, without apparently disturbing the appearance of the REM-W behavior: (a) normal memory consolidation fails despite encountering subsequent, novel, object place recognition, and (b) it also erases and impairs fear-conditioned contextual memory, (Boyce et al, 2016).
Loss of contextual memory consolidation can be a life-or-death matter for a mouse's travel itinerary who forgets the presence of predators they had encountered in certain places, or who must remember that some routes require passing through partial environmental barriers to reach safety. One can view this memory disfunction as missing the minimum degree of wake supplied by the *Wæcnan*-state, which may fall below that threshold by being optogenetically silenced. More work in this area may clarify this.

In some circumstances, H. sapiens also will certainly be exposed to danger or death in the same way if contextual memory capacity is impaired or is missing. Note that these REM-W functions require motor operations to produce the effect that assists survival. Motor capacity, and its readiness through maintenance, must become engaged during REM-W if contextual memory consolidation is to be functional during this state of consciousness.

This is consistent with my essay (Arenson, 2022), where Motor-Mouth Theory (MMT) proposed that REM-W was adapted originally to operate and maintain the motor system. This may still be so. The atonia function is now used in order to twitch muscles, which reduces the visibility of gross movement, and lessens predator vulnerability during motor assessment in REM-W.

The absence of atonia in REM Sleep Behavior Disorder (RBD) is an emblematic effect of that disorder. RBD sufferers face difficulties due to the absence of atonia during dreaming. For example, whether one calls this sleep or

awake, they may beat up their sleep partners without intention or any hidden desires to harm them. More frequently, they injure themselves, often by tripping over obstacles not appearing in their dream but existing in their bedroom or home.

I also note the strange coincidence that RBD, an illness, exhibits wakefulness as a defining symptom, considering that wake is here proposed to be the original state of REM-W. Is it useful to wonder if RBD is an atavistic expression of this proposed original state of REM? Does that viewpoint produce useful ideas for investigation or treatment of RBD? Are oxygenation levels in red blood cells considered in RBD diagnosis? Is this now a useful area of investigation for RBD?

2.2. Konkoly et al (2021) show lucid dreamers responding to complex auditory information during REM-W, as if awake

Recent work by Konkoly et al, (2021), with lucid dreamers, has revealed that during REM-W such dreamers are considered to be "asleep" and dreaming, but also awake enough -- in the ordinary meaning of these words -- to accurately respond to complex auditory information from an external source during the dream, (Konkoly et al, 2021). What is this except strong evidence that this state, the REM-W, exhibits a cardinal criterion of the traditional state of wake, but during REM-W? While it is well known that sleep is not a perfect state of disconnection and the brain continues to monitor external stimuli and sometimes respond with a behavior (as one sees, if rarely, in sleepwalking), is it time to acknowledge this as fitting a criterion of wake? The accuracy of the responses to complex auditory instructions in different stages of consciousness is detailed by the Konkoly team. They give SWS its due as the archetype of sleep, the original model of sleep in Western medicine, but notice that the Konkoly effect was only found during lucid dreaming in REM-W. This could indicate that lucidity itself may depend on the degree of wake brought by the *Wæcnan*-state. Lucidity researchers might investigate further.

2.3. Oudiette et al (2018) observes irregular breathing during REM-W that would be normal during wake

These authors, Oudiette et al, (2018), see a typical characteristic of wake breathing in their subjects breathing pattern during REM-W, but call it sleep because it occurs during REM-W. In the next section I quote Thomas Kuhn's ideas on the difficulty of conveying new meaning for existing science using common words. I preview two sentences from that to help us understand where the Oudiette researchers misscharacterize an arguable result. This is a quote from Kuhn's book "The Structure of Scientific Revolutions", (Kuhn, 1970, 2nd ed. at p. 149):

> *"The laymen who scoffed at Einstein's general theory of relativity because space could not be "curved"--it was not that sort of thing--were not simply wrong or mistaken. Nor were the mathematicians, physicists, and philosophers who tried to develop a Euclidean version of Einstein's theory."*

The Oudiette abstract says:

> *"Breathing is irregular during rapid eye-movement (REM) sleep, whereas it is stable during non-REM sleep. Why this is so remains a mystery. We propose that irregular breathing has a cortical origin and reflects the mental content of dreams, which often accompany REM sleep. We tested 21 patients with narcolepsy who had the exceptional ability to lucid dream in REM sleep, a condition in which one is conscious of dreaming during the dream and can signal lucidity with an ocular code. Sleep and respiration were monitored during multiple naps. Participants were instructed to modify their dream scenario so that it involved vocalizations or an apnoea, -two behaviours that require a cortical control of ventilation when executed during wakefulness. Most participants (86%) were able to signal lucidity in at least one nap. In 50% of the lucid naps, we found a clear congruence between the dream report (e.g., diving under water) and the observed respiratory behaviour (e.g., central apnoea) and, in several cases, a preparatory breath before the respiratory behaviour. This suggests that the cortico-subcortical networks involved in voluntary respiratory movements are preserved during REM sleep and that breathing irregularities during this stage have a cortical/subcortical origin that reflects dream content."*

Being awake is clearly present. They "were not simply wrong or mistaken" to ignore the wakefulness. This would have been an easy call, if REM theory only allowed it. They would have been first if they had proposed an awake state. At some level, did they see that it was wakeful breathing behaviour? Did they see it was associated with vigorous exercise? This awareness "at some level" seems to me to have been essential to their puzzlement. It seems they could not bring themselves to accept what was plain and obvious to them. They begin by stating:

> *Breathing is irregular during rapid eye-movement (REM) sleep, whereas it is stable during non-REM sleep. Why this is so remains a mystery. We propose that irregular breathing has a cortical origin and reflects the mental content of dreams, which often accompany REM sleep…"*

A mystery exists, they say. In their favor, this is true if REM-W is sleep but not if its *Wæcnan* nature is considered. The authors could have, but do not, consider that this feature may point to REM-W not being wholly or only a type of sleep, and that it also fits as an awake-state in these behaviors. Such patterns of behavior can be difficult to recognize as wake unless one accepts that the subjects can be experiencing a wake event. And then it is simple and obvious: Space can be curved and REM can be wake.

3. Kuhn and Fleck clarify our dilemma

Although some features of behavior mentioned by the BKO researchers during REM-W clearly resemble wake, this property has been largely ignored by them. REM dreams may occur as a wake state and the ideas of Kuhn and Fleck help us see how and why the BKO findings failed to trigger an acknowledgement of wake.

Later in this section I refer to a series of studies of historical mass trauma events in Israel reported from the Technion University Sleep Lab, chaired at the time by Professor Peretz Lavie. Those studies found an appearance of a capability similar to wakeful suppression of thoughts, but occurring during REM-W. Some dreamers appear to have the ability to suppress dreams during REM-W, in circumstances where

nightmares usually are expected.

Neither Thomas Kuhn nor Ludwik Fleck mentions any dream science theories. Still, the books of Kuhn (1962 & 1970) and Fleck (1935 & 1979) are useful for dream theorists when considering new concepts, including this proposal of REM-*Wæcnan*, (REM-W). Extracts from Kuhn are cited and then a quote from Mario Bunge on Fleck is provided.

Here is the full quote that includes the false belief that, "space cannot be curved", from Kuhn's book. He is in full stride on the *incommensurability* block to the recognition of new theories despite their value in resolving anomalies that have developed in existing theory.

> *"More is involved, however, than the incommensurability of standards. Since new paradigms are born from old ones, they ordinarily incorporate much of the vocabulary and apparatus, both conceptual and manipulative, that the traditional paradigm had previously employed. But they seldom employ these borrowed elements in quite the traditional way. Within the new paradigm, old terms, concepts, and experiments fall into new relationships one with the other. The inevitable result is what we must call, though the term is not quite right, a misunderstanding between the two competing schools. The laymen who scoffed at Einstein's general theory of relativity because space could not be "curved"--it was not that sort of thing--were not simply wrong or mistaken. Nor were the mathematicians, physicists, and philosophers who tried to develop a Euclidean version of Einstein's theory. What had previously been meant by space was necessarily flat, homogeneous, isotropic, and unaffected by the presence of matter. If it had not been, Newtonian physics would not have worked. To make the transition to Einstein's universe, the whole conceptual web whose strands are space, time, matter, force, and so on, had to be shifted and laid down again on nature whole.* (Footnotes in the original are omitted)

Here, next, is Kuhn's useful conclusion. He said, only those

> *"… who had together undergone or failed to undergo that transformation would be able to discover precisely what they agreed or disagreed about. Communication across the revolutionary divide is inevitably partial…"*

So, it behooves us to be mindful "to discover precisely" what you and I agree on, or disagree on, if we are to adhere to Kuhn's dictum and communicate effectively.

Kuhn's rubric on "incommensurability" and the corresponding idea from Fleck on "thought styles" help explain the endurance of the two incomplete but recently dominant dream theories: Content Analysis by Calvin S. Hall (1909–1985) ably assisted by Robert (Bob) Van de Castle (1927–2014), which does not inform dreamers of the interpretation of their dream and so cannot be corrected by feedback from the dreamer. And, the original theory of Sigmund Freud (1856–1939), which relies on an unlikely 19th century belief in the existence of an organic unconscious storehouse where dreams form. The existence of such an organ of the unconscious as the cradle of dreams has so far never been imaged or detected except by the presence of dreams themselves (a false argument) in a H. Sapien body, despite the plethora of imaging technologies we now have. The continuing value of Freud's ground-breaking work is the belief that dreams have real world meaning, and the meaning can be found in the words used to describe the dream, and meaning can be shared effectively with those words. Content Analysis does not disagree. Freud was a hero of Calvin Hall. (Note the essential role of words in both theories.) I also agree that words in a dream report are central, although their pronunciation is often slurred in a way that suggests the true context, and the meaning can be disguised from the naïve dreamer, or obvious to the experienced one who is aware of Motor Mouth Theory, (Arenson, 2022; 2023).

The approach to meaning by Freud is teleology: that is, it serves a purpose rather than explaining the cause (by which dreams arise). The opposite, deontology, allows us to adopt the viewpoint that Freud's proposal was only intended to support his talking therapy, not because the existence of an unconscious storehouse of dreams was a universal truth, aside from its role underpinning his therapy. Lawyers have a similar idea: We call it a "legal fiction". It is sometimes useful in an analysis, for example, in deciding whether a defendant has been negligent, the court may use the legal fiction of the "reasonable person" (Wikipedia, 27 June 2025) to consider the point.

If we assume Freud never intended nor wished to achieve cult-status, it allows us to continue to search for the cause of dreams, which Motor Mouth Theory does. MMT proposes that the function of dreams is to assist in the development of a settled pronunciation of words at that time in that location. Absent this (brain stem ?) function, words could be spoken any-which-way and fail in their role of communication.

In the last several decades new ideas were proposed to account for REM-W dreaming. An important study came from the Yuval Nir and Giulio Tononi, (Nir & Tononi, 2010). They observe the similarity of wake and REM-W. Here, specifically referring to the EEG, they connect REM to wake-like activity seen on the EEG:

> *"This feature is known as 'high arousal threshold', and it persists in REM sleep despite its wake-like low-voltage EEG".*

Note "wake-like" in reference to "REM sleep" on the EEG. They emphasise the similarity of consciousness between REM-W and wake. They sum up:

> *"In summary, dream consciousness is remarkably similar to waking consciousness, although there are several intriguing differences in volition, self-awareness and reflection, affect and memory, and there is considerable variability between individual dreams.*

They also call on researchers to move "beyond sleep stages" to connect dream consciousness to wake. I agree.

For a recent example of the search for specific brain functions involved, see this work (Scarpelli et al, 2021) and their citations. Other studies enlarged our understanding of REM-W dreams, based on polysomnographic (PSG) protocols, or video-PSG recordings with provoked awakenings.

These theories are similar to each other, and at odds in different ways. This is true also in relation to my Motor Mouth Theory (Arenson, 2022) (Arenson 2023). MMT, of course, was also incomplete in light of the Tsai et al findings of excess O2 of Red Blood Cells during REM-W. This pushes every dream theory off square until incorporated. My argument here edges towards greater functional completeness of MMT by allowing for the Wæcnan-state of ancient wake during REM-W. REM viewed as ancient wake likely is more consistent with excess O2 for Red Blood Cells during REM,

as found by Tsai et al, than REM as ancient sleep.

We know why we eat. We know why we breathe. We have useful theories as to why we have SWS. Why do we have REM? If you answer "for our dreams", I agree (Arenson, 2022) but only at a later stage of our evolution when we needed words to communicate during collective activity and for words to be useful they needed to be pronounced more or less the same by every member of that community. It is thinkable that until we developed words, REM-W occurred nightly without dreams. In that state the motor system would still have been assessed during the atonia of REM by twitching the muscles that move our movable body parts, all without the need for dreams.

In my 2022 essay on MMT, before learning of the Tsai et al effect, the essay proposed that the function of REM-W originally was to maintain the motor system, which I now can see appears to have been strengthened by extra O2, (the Tsai et al effect). Dreams may have been an incidental effect that did not begin until H. habilis needed a way to coordinate the pronunciation of words when words were needed in these communities as some local genius began to assemble and teach the elements of lithic core technology and teach crews to dig out the stone blanks from rock quarries and then chip sharps from them, which eventually led to modern civilizations largely based on the function of words to achieve progress.

My 2022 essay cited the archeological evidence found by Mary Leakey in Olduvai Gorge near Lake Victoria in Tanzania. She unearthed stone sharps that likely were made nearby by an H habilis community upwards of 1.5 MYA. That essay discussed the benefit of this to the H. habilis. Stone sharps were a revolutionary development. Aside from making food hunting more efficient by enabling field butchery, the sharps were usable as saws for building shelters from branches, and also, finally, they were deadly effective as tips to arrows and to spears for use in hunting or as weapons.

In my 2022 essay, it was proposed that REM-W dreams may have allowed H. habilis to develop a community-wide feedback system for the pronunciation of the new words that were needed to organize and teach the skills needed. Dreams, I proposed, were a development that in Homo, at least, allowed unique pronunciations of the words in the language of a given community. The best Canadian example is found in delightful Newfoundland on the far east coast. They are speaking English, they will assure visitors who frequently ask, "What language are they speaking?"

Of learned behaviours held in common by all mammals, evidence accumulates that a language facility may be one. REM has been found in every aquatic mammal studied (Siegel et al, 2019), and there are reports of repeating sounds uttered in a context where repeating sounds might be names. REM might be instrumental in naming behavior.

The REM-W dreams, which I named the "Holophrastic Linguistic Dream type" (HLD-type), remain in nightly use in our present time for their original purpose, to achieve social communication, the common pronunciation of words. Daily reports of the words describing the previous night's dreams allow a local community feedback system of pronunciation to come into existence. It strikes me that we tell our dreams guided by the brainstem's control of speech muscles. We use words used in the dream or tell ourselves, or our partner or friend or co-worker, speaking each word in a way allowed by our muscle memories, and this tends to produce common sounds of words in our community. I can imagine research that might test this.

The brainstem is likely not in charge of assigning meaning to words in your dreams. Meaning is a matter for higher reaches in the brain. I consider the dream function to onset at the brainstem level, where it operates a kind of echo chamber. The brainstem will register words the dreamer hears or uses, during the day. With that, when the dream is occurring or is told, the brainstem is in position to influence or control the speech to mimic, or at least resemble, the communal phonetics of the words to be spoken, without consideration of meaning. This shapes the sound of the words towards what the dreamer has heard while being out and about.

The brain stem is treated here to have a considerable degree of control to influence the muscles of speech, whether directly or indirectly. This muscle control arrives at the mouth and reflects my theory's name: Motor-Mouth theory. This influence on pronunciation is so ubiquitous it is largely invisible culturally. It does, however, explain the existence of local accents. How you say a word is how you typically hear it said. Differences develop and are fecklessly reinforced by the brainstem's role, which may be limited to smoothing out linguistic discordance in that specific place at that specific time, shaping differences towards a local standard.

Unique accents within the same language of a large political entity are common. They are less now under the influence of the electronic media. Still, differences in pronunciation occur as distance increases. This is despite a common language, as one moves between towns, provinces or states.

The memory of dreams is important in nightmares. In cases of Post Traumatic Stress Disorder (PTSD) following trauma, I long ago noticed that among my injured legal clients, nightmares about the trauma played a triggering role in their misery. Usually, an auto accident injury was to blame. Not in everyone, but the injury often had much worse impact if they were awake and saw the collision developing, to their horror, it seemed to me. If they were asleep when the accident occurred, they had fewer nightmares, and usually healed sooner and better, I saw. It was a puzzle. Was it the horror and the spike of emotion, if one was awake? Not every client showed this effect. Was I overcalling it?

I later learned something similar had been discovered through studies done at Technion University in Haifa, in the sleep lab headed by Professor Peretz Lavie, author of a readable, very useful book, "The enchanted world of sleep", (Lavie, 1996), and recently author of a review article (Lavie, 2024), titled "My voyage in the enchanted world of sleep."

I was fortunate to meet him one time at a Technion event (after his 1996 book came out but well before the 2024 article) where we had a brief discussion on dreams. He touched on the importance of enough EEG paper when Aserinsky was watching for REM that led to the reproduction of the famous 1st EEG of REM in the 1953 paper. Recently, Prof. Lavie, now retired from his eventual position as President of Technion university, kindly sent me a note and a copy of his recent paper (Lavie, 2024), mentioned above, which enabled me to search more deeply into the studies on dream suppression at his laboratory at Technion.

Prof. Lavie's 1996 book had an intriguing but condensed review of their discoveries regarding nightmares and degrees of recovery. The 2024 paper has greater detail plus the references to their published work on this topic. I learned that my observation of accident victims asleep having a better

out-come and fewer nightmares compared to those awake to witness the impending crash, had not come to light in their studies at the Technion, based on dreams of Holocaust survivors and others. This is not to say my conjecture has no benefit, just that other factors also are involved. I say this because the main difference comparing my observation to what they observed is that the Holocaust survivors obviously were not always asleep when the horrific adverse events were occurring.

But what was similar was that they had fewer dreams then most other Israelis who never were in the death camps. It also appeared that somehow, just as with the asleep accident victims in my practice, those holocaust survivors with fewer dreams had better emotional recovery. Based on their work, it seems likely that being asleep and avoiding the horror of seeing the accident about to occur is not essential to a lighter burden of after-effect. One explanation for this result seemed plain enough: It was because these Holocaust survivors somehow had a natural capacity to manage the number and duration of dreams, leading to far fewer, shorter, typically benign dreams.

My new hypothesis favours the existence of this capacity in a population, with some having a heightened degree of the wakeful capacity I associate with REM-Wæcnan, like variation in I.Q. We need a test for it. Perhaps it can be taught and learned? It would be useful training for combat troops, if it can be taught.

How exactly the dreamers achieved these reductions in number and content appears not to have a definitive explanation to date, unless one assumes it was somehow a willful, voluntary act of dream suppression, which is my fallback belief of how this occurs. Seeing it as voluntary action of ancient origin may place its beginning when speech began, and lead to the *Wæcnan*, or REM-W, wakeful activity. In his 2024 review article, Prof. Lavie refers to eight published journal articles from their lab on this subject from 1979 to 2002, (Lavie, 2024). A succinct overview occurs in a recent interview, where Prof. Lavie is quoted as saying,

> *"…in Holocaust survivors, adjustment to life after the Holocaust was correlated with almost complete suppression of dreaming which led us to suggest that repression of dreaming is an important adaptive mechanism after a severe trauma." ("CrazyEngineers", 2025)*

I accept "adaptive mechanism" as the present understanding of its origin. That certainly applied to some of my injured clients. How does the dreamer do this? It may be the simplest answer, which assumes the onset of REM-W dreams occur as a form of wakefulness, and they can be put under voluntary control – to some degree. If so, voluntary *Wæcnan* (awake) control of dream content, in suppressing emotionally searing memories, is one key advantage of the wakefulness of *Wæcnan*, and is a deduction from the REM-Wæcnan theory.

The brief account on a few pages in Prof. Lavie's 1996 book notes that the whole population of a nation may experience war trauma. This account was addressed in more detail in his 2024 article. War trauma may result in a reduction in dream activity overall. The 1982 war between Israel and Lebanon was the case in point. The population at large, had fewer dreams, his lab found. This may mean that the dream function have some mechanism or degree of self-controlled onset that may appear in every population.

In Prof. Lavie's 1996 book one reads about research where they observed evidence of the reduction in dreams overall in a population, done by Dr. Yaron Dagon, a clinical psychologist at the Lavie sleep lab in Technion at that time, who conducted a study that found that among Israelis who experienced that 1982 war between Israel and Lebanon, the reduction in dream recall was similar to the reduction experienced by Holocaust survivors. Just as some of the survivors avoided memory of the Holocaust experience and were the best adjusted while awake, similarly, the aftermath of the 1982 war saw the same result in those who recalled the fewest dreams among the population, generally.

The 1996 book mentions a similar result in a study by a noted US dream scholar, Dr. Milton Kramer, whose results were stifled, and not published, implying they were not considered reliable, (if so, that suppression should be reversed, now) although why this occurred is not stated. Between Prof. Lavie's1996 book and especially his 2024 essay, the history of the work from his lab comes into focus and is more than intriguing. They will be fruitful sources for future studies to build on.

One hopes future investigators consider the question raised here: is REM-Wæcnan, a wake state chained by atonia? I propose that these REM-W dreams should be counted as a form of wake because of periods of subtle wake, while one is dreaming in the Wæcnan-state under a restricted form, I must agree, but with a sensation of awake reality, as experienced by most of us.

If fewer REM-W dreams of war by survivors can be achieved, better outcomes for the dreamers' life adjustment are expected. This could be seen as inferential proof that the wake capacity of the Wæcnan-state is operating to reduce dream thoughts on the topic. Being awake clearly is more consistent with capacity for self-beneficent behavior than being asleep.

Generally, while awake, one can suppress memory, albeit to a varying degree, which is tied to emotional health. In the cases under discussion here, the suppression occurs during a time that is expected to be filled by dreams. More research might improve the resolution, but we have results from the Lavie sleep lab that supports the proposition that REM-W dreams are subject to voluntary control *in extremis*.

Under that supposition, when the Wæcnan-state is considered during REM-W as described here, REM-W may be acting as editor of the quantity and duration of dreams and of their content. This would account for the phenomenon observed by Dr. Dagon and other researchers in the Lavie lab.

At this point in the argument, I return again to the role of the Tsai discovery: The proposition in this context is that REM-W is providing the uptake opportunity described by Tsai et al, that is, the supply of extra O2 to Red Blood Cells during REM-W. This also contributes the extra energy to achieve the essential will-power needed, which then allows that person to resist and avoid memories of trauma, I speculate.

The new category of dreams proposed in my 2022 essay, the HLD type dream, is modelled on a 'Griffin' type (i.e. a duality of function by design), and gives rise to a possibility that the Wæcnan status of the brain during REM-W, with or without atonia, may help one to avoid PTSD. This envisions a wake-like capacity to censor the form of thinking we are taught under present dream dogma that we must experience as dream content.

A brief comment is next on Fleck's insight of how new

ideas may emerge, and that closes this section. Kuhn was respectful of Fleck's explanation for the ascendency of any theory and for its replacement. Fleck used the history of the changing scientific understanding of Syphilis over the 400 years ending in 1930, when he was writing his book "Genesis and Development of a Scientific Fact", (Fleck, 1935). In a 1981 review of the reprint of Fleck's book, the eminent philosopher of science, Mario Bunge (1919 -- 2020), then an Emeritus Professor at McGill University, Montreal --an expert worthy of belief-- reviewed Fleck's masterpiece, at that time recently republished and translated into English. Prof. Bunge provides a summary of Fleck's 1935 work that had built an insight around the then newly developed Wassermann test for Syphilis, where if one was infected, the test results were "positive". Bunge explains,

> *"Fleck claimed that this was not so much a 'fact' (or a hypothesis borne out by plenty of evidence), as a construction by a community of researchers over a long period of time. Moreover, it is a construction that different 'thought collectives,' such as the astrological and the religious ones, would not accept or even understand. Thus 'scientific facts' would be neither subjective nor objective, but the creatures of groups of people united by a thought style." (Bunge, 1981)*

Sounds like what may have happened to block Dr Kramer's idea mentioned in Professor Lavie's 1996 book. This could easily have applied to Freud and Content Analysis on their ideas on dreams, but did not. Why one and not the other? We are led to a lookout point in Fleck's theory, where we sometimes see hazy outlines of a new consensus that may or may not come into existence. It may take time to know. Thought styles as well as content are involved.

Between Kuhn and Fleck, one sees how new scientific ideas emerge, and some of what sustains and constrains the present theory/practice. In this case -- the study of REM-W including some dreams, as a wake state.

4. Is REM-W sleep-like largely because it is chained by atonia?

REM-W does have features, in addition to dreams, that create the resemblance to sleep, especially as arises from atonia. And as well, SWS has some dreams and presents with reduced muscle activity, but not atonia. Perhaps this is because SWS is truly sleep and REM-W is wake chained by atonia to keep us in bed? Arguably, with the recent evidence from Tsai et al, we can begin to see REM-W as a more highly evolved state that now merely mimics sleep … or is it a prisoner of sleep?

And what of dreams during REM that most of us feel are occurring while we are "out and about" in reality, before we awaken, (Foulkes et al, 1966). Admittedly, dream science did not have this brilliant finding by Foulkes et al in 1953. His 1966 experimental finding is the bed-rock foundation of my thesis that REM-W encorporates, in an important sense, wakefulness. Foulkes is the ideal expert on this matter. He has no axe to grind against Kleitman. The opposite. Foulkes was an ardent admirer of Kleitman. He would be the last to undermine Kleitman. Foulkes was inspired to enrol in the University of Chicago hoping for a spot in the lab of Kleitman after the 1953 announcement of REM, but Foulkes entered that program the year Kleitman had retired from it, and was never his student.

Kleitman's 1953 paper did not address the similarity of REM-W EEG tracings to wakeful EEG tracings. This similarity is visible at a glance from the EEG they published, if one was familiar with wake EEG's. Earlier in my essay, in section 3, I cited the reminder from Nir & Tononi that "REM sleep" is "wake-like low-voltage EEG", based on the international criteria for REM sleep EEG states. Over time, other dream scholars also have commented on the similarity between EEG tracings of REM and tracings of wake, while contrasting the divergence of the REM tracings between SWS and wake.

Google Scholar produced a 2 ½ decades-old publication, (Purves, et al, 2001) on this point and it is not the earliest. Purves et al referred to their illustration, "figure number 28.5". It shows the EEG of the parts of sleep. The text states: "In REM sleep, the EEG recordings are remarkably similar to that of the awake state". They were not alone. A decade later this opinion was supported when J. Allan Hobson, (1933 – 2021), a recently deceased and much-admired leader of modern dream research, observed while discussing lucidity during REM-W: "…the EEG coherence during lucid REM sleep is roughly equal to that during waking", (Hobson, 2009). Lucidity is often described as akin to wake while asleep. Is this a paradox? Not in my view. The Wæcnan-state refers to a form of awake reality usually chained by atonia, but there are validated reports of vigorous behavior during lucidity that occur during REM-W, where atonia is overcome, or perhaps undone, while the person remains in REM and is said to be "asleep", but appears to behave as if awake.

That published 1953 EEG tracing from Kleitman's lab included an EEG of REM-W that was quite unlike Slow Wave Sleep. Rather, that Left Frontal EGG tracing of REM-W was more similar to the EEG of awake (but the wake EEG was not shown in that report). Was this similarity mentioned at the time? Perhaps in conversations, but not in the publication. This EEG certainly was newsworthy. The first, ever, recorded EEG on a human occurred in 1924 in Germany by Hans Berger, (on his son, as his test case.) The 1926 report on Active Sleep, in infants (Denisova and Figurin, 1926), came out a decade or more before EEG began in general use. Considerable mental effort is needed, as predicted by Kuhn and Fleck, to overcome the habitual belief that REM-W sleep and wake are opposites. REM-W appears to have features of both sleep and wake. To remind myself, I use my polysemic name for such a function: the Wæcnan function.

5. The more dire the more desire: *Conatus*, what exists strives to continue to exist (Spinoza)

Tsai et al found that the REM-W state was favored with extra O2 during respiration. Assuming this adaption was present in Chordates, likely it was passed down to their descendants, to the reptiles and then to the mammals. It gave Chordates enhanced survivability when their water habitat became depleted in dissolved oxygen: it facilitated their motor escape from such Dead Zones. Reduction of dissolved oxygen in their water habitat remains deadly for current aquatic creatures needing O2, who must escape from dead zones.

Controversy surrounds the role of chance in Darwin's theory of evolution. At first, Darwin's theory required that a useful random event had occurred. This is the origin of the phrase "natural selection". Darwin did propose this in his first edition, but he had a change of heart by his 6th edition in 1872,

where he wrote, at Ch. 15, p. 395:

> *It appears that I formerly underrated the frequency and value of these latter forms of variation, as leading to permanent modifications of structure* independently of natural selection*.*

It is shocking how many learned authors of science are unaware of the 6th edition and/or fail to acknowledge that Darwin's theory was modified in 1872, and he no longer required random events as the only stimulus for evolution.

In this 6th edition, Darwin, in effect, adopted the idea proposed by Spinoza (1632–1677) two hundred years earlier. Spinoza's idea translates into English except for one word as "…everything in nature has a conatus, a fundamental striving to continue to exist." *Conatus* was Spinoza's Latin name for this. No randomness required. Darwin did not mention Spinoza, but *Conatus* has frequently been proposed. In the modern era, philosophers such as Henri Bergson came to similar ideas. See Bergson's 1907 essay that proposes creative evolution exists (Wikipedia, 19 November 2024, Bergson).

Moreover, an idea has been advanced in recent years that specifically extends Darwin in a way that Spinoza would applaud. This is an argument that even life itself can appear out of "the mingling of elements of nature that up to that point were not alive, but who come alive when mixed, and remain alive thereafter." (Pross, 2011). Professor Addy Pross, Professor of Chemistry at Ben Gurion University of the Negev, named this "Dynamic Kinetic Stability". This theory proposes that a bridge exists from chemistry to biology. Pross refers to a "process of complexification" and proposes that once initiated moves "toward more complex systems". If so, he argues, can life be fully classified and categorized since life is more a *process* than a *thing*? (One can read the last sentence substituting wake for life: 'Can wake be fully classified since wake is more a process than a thing?')

This idea by Prof. Pross is consistent with the findings of Prof. Lavie and his lab colleagues, mentioned above in section 3, who found Holocaust survivors able to achieve suppression of dreams (which implies that the quantity of REM dreams is subject to wake control) in folk who apparently live a happier life, as a result.

This section 5 title includes my little ditty, "The more dire the more desire". This proposes the existence of irresistible behavioral responses in dire circumstances, and in particular, 'complexification'. This occurs in the presence of adversity that then sees some behavioral cross-over that achieves survival. Also, one should note that research on adaptions that are independent of natural selection has attracted significant work over decades, already. To date, this work has been focused on very small creatures. Patricia L Foster, Professor Emerita of Biology, at Indiana University, published a paper, (Foster, 2000), that provided a review of work to that date that recognizes what one can call "summonsed evolution", as the lawyer in me wants to say, or, "adaptive evolution", which means the same. Creatures or organisms studied include Escherichia coli, Salmonella typhimurium, Bacillus subtilis, Pseudomonas sp. and Clostridium sp., and, in the eukaryotic microbial species, Saccharomyces cerevisiae and Candida Albicans. In the past 25 years substantial additional work has been done.

Conatus can be understood as a capacity that 'strives' for adaption. The adaption can occur outside of the randomness implied by "natural selection" theory, as Darwin acknowledged, and no miracle is then occurring. *Conatus* is a principal of action that can lead to "a wished for" evolution in any creature, and long before the creature is capable of human-type wishing. *Conatus* names a process available to living creatures, and Spinoza also included the non-living, anticipating the work in our time of Prof. Pross. Every problem encountered and solved exhibits *Conatus*.

Noticed that Spinoza's argument is that *Conatus* is true for all material things, alive or not. This makes the English translation from the Latin '*Conatus*', into "striving", potentially a confusing and weak choice linguistically for the non-living. A synonym for striving is "moil", which means "to churn about continuously", as in "clouds moiling in the wind", (American Heritage Dictionary of the English Language, 2024). We can recognize and associate 'moil' with this relevant meaning for conatus in the living as well as the non-living clouds, and the inorganic molecules that Foss evidently considers.

A maintenance function is essential for any motor system, and sooner or later becomes necessary, as users of things with motors know. REM-W may have survived, perhaps for hundreds of millions of years, in creatures of all types. In this view, some, perhaps many, life enhancing effects are likely to have been, associated with REM-W, and therefore the extra O2 discovered by Tsai et al, that fuels our metabolism during REM-W, may still be protective.

An active intervention by the REM-W state may come into sharper focus if viewed as occurring during wake, at least in the sense of Wæcnan that so much mimics a waking state in the subjective experience of the person as we see in the Foulkes et al (1966) study, and not as a sleep state that functions by disengagement, as SWS mostly does. Re-categorizing REM-W as an ancient state with features originally aligned to a wake state, may help us gain a new perspective. That is my proposal with this essay.

Here I have proposed that REM-W is a vestigial form of ancient Wake that was then crucial to sustaining life in the water habitat of our most remote ancestors, long before reptiles or mammals appeared. REM-W may well have other appreciable functions to this day beyond what one can see in the BKO group. But if so, what are they? More REM-W study may lead the way. REM-W's role in motor operations and in maintenance, participates in the complex motor activity needed to produce the speech sounds of words.

My 2023 essay on MMT (Arenson, 2023) proposed that the REM-W dream sensation of "being out and about" as found by Foulkes et al, (1966) may be triggered, or helped along, by endogenous N,N Dimethyltryptamine (DMT), which, I proposed, may endow REM dreams with the "Unreal Reality" sensation. Although the sensation of unreality is more likely due to DMT and is less likely to be the result of the extra O2, the Tsai et al findings that REM-W dreams are likely energised by extra O2 may impact that conclusion. Because REM-W dreams mimic wake experiences, and this behavior may reflect the origin of REM-W as an ancient wakefulness in the Wæcnan-state, the Tsai et al findings requires us to consider the synergistic effect of DMT together with extra O2. It is plausible that the extra O2 added during REM state is enough to experience the illusion of unreal reality during REM-W. The question is posed if DMT is essential to that experience in light of the Tsai et al findings. More study is needed.

It seems likely to me that at some point, possibly tied to the emergence of air-breathers, who crawled out of the oceans,

lakes and rivers, to make their home above the water level, we, the air-breathing chordate's descendent species, developed the precursors of each of the modern manifestations that are Wake, Slow Wave Sleep and REM-W.

It is also intriguing to consider if pre-homo creatures with calls, as well as contemporaries of the Homo lineage, had or have names for themselves and others. Modern whales are believed to have calls and may well have names for each other. Also, elephants are now believed to have names for themselves and for others in their herd, (Pardo et al, 2024). Words/names appeared in other mammalian species, including our Homo line, so there may have been a need for the HLD-type dream to appear for the purpose of shepherding phonetics in other species of pre-Homo creatures, and continuing in their modern descendants. Elephants may dream to maintain their phonology, although, apparently, they must lie down to enter REM (because of atonia?) and do so only every 3 or 4 days. Their brain-stem may influence their pronunciation. Why not? Some of the dolphins sleep one side of the brain at a time. Is that an adaption or work-around for REM-W?

The Wæcnan-state continues to operate its vital role of assessing and maintaining all aspects of the motor system during the REM-W state, in this view. An advantage of atonia is to minimize movement and therefore minimize predation while the REM-W state assesses that body's movement function. This called for a hybrid state: one that shares the appearance of sleep-like features, while at the same time, behaves somewhat like awæc. REM-W also fulfills this role.

6. Rial et al proposed that tonic REM began as post-basking behaviour in reptiles as a wake state.

In three publications, Rial et al presented the case for the adaption of REM as a wake state in reptiles that occurred before mammals (and homo) appeared (Rial et al 1993), (Rial et al 2010), and a clarifying essay without radical changes (Rial et al 2022). It is obviously significant to the proposal in this essay that REM is believed to have occurred as a wake state in reptiles by the Rial investigators. This can not be overstated. Although I overlooked Rial's work until well after this essay was underway and I was arguing that REM-W was a wake state, this essay strengthens the Rial arguments and *vice versa*. Therefore, I am happy to acknowledge the reasoning of Rial and his colleagues.

The Rial work also builds a bridge in the continuum of chordates to mammals with Rial's proposal in their point 5, that post-basking behavior of reptiles, which is goal directed, evolved into the tonic REM of mammals including, now, in H. sapiens. (Reminder: While (asleep) in REM, the eye movement occurring in bursts are called "phasic REM", and those eye movements occurring as isolated events during REM are called "tonic REM". It appears to be a recognized fact that the tonic eye movements during REM are strongly associated with dreams.)

In the 2010 publication the Rial authors summarize the proposal in their abstract:

> *"(1) the active state of reptiles is a form of subcortical waking, without homology with the cortical waking of mammals; (2) reptilian waking gave origin to mammalian sleep; (3) reptilian basking behaviour evolved into NREM; (4) post-basking risk assessment behaviour, with motor suspension, head dipping movements, eye scanning and stretch attending postures, evolved into phasic REM; (5) post-basking, goal directed behaviour evolved into tonic REM and (6) nocturnal rest evolved to shallow torpor."*

Point (2) is consistent with my overall contention, and points (4) and (5) solidify the main proposal I make in this essay. The bursts of REMs are called *phasic* REM. Single eye movements are called tonic REM. I accept that the phasic and *tonic* REM seen in H. sapiens probably originated as an ancient form of the wake states in reptiles, and we typically experience a sensation close to daily wakefulness while we are in that tonic state of REM-W. In their 2022 paper the Rial authors explicitly propose that this was the beginning of mammalian sleep. What they describe is similar in part to the proposal made here that REM-W continues in us as a form of wake. What I call REM-W (for REM-Wæcnan) is a short form for REM-wake.

7. Latest developments and last word: Implications from REM-W as an ancient form of wake

One hopes that this essay about the Tsai et al results will cause the reader to take away the proposal that REM-W began as an ancient form of wake, possible as early as the first chordates, and that REM-W still exhibits signs of this wake state during REM-W periods, although H sapiens are usually restrained from physical action by atonia during REM-W. Note that the necessity of the atonia function during REM-W strongly implies that REM-W once occurred during 'normal' wakeful motor activity, (as Rial also alludes to). This allows the view that REM-W did not begin as a random development by chordate creatures, rather it was willed or summonsed into function, as allowed by Darwin in his 6th edition. Using the term proposed by Prof. Pross, we can call this "Dynamic Kinetic Stability". It meets an urgent survival need. I propose here that one such recurrent survival event was to escape oxygen depleted dead zones to those in a water habitat. As well as Darwin's amendment in his 6th edition, which proposes that evolution may be summonsed in some circumstances. I also acknowledge Spinoza's conatus, or "moiling" in English, which is also attributed to modern philosophers like Bergson, and others.

As to the Tsai et al results, I proposed in this essay that the excess O2 during REM-W first appeared by Chordate adaptions of REM-W to maintain their motor systems with the enhanced fuel supply of extra O2, which could propel them out of aquatic dead zones, if necessary. This function likely also appeared in the early reptiles, as proposed by Rial et al and as mentioned in section 6. Its presence today could be atavistic, (as I proposed in my 2022 essay), but it more likely has continuing physiological uses, especially for aquatic O2 dependent organisms. Excess O2 may sometimes be useful among air-breathers (including water dwellers), for emergency occasions, such as when O2 is needed for survival of the individual.

The Tsai et al findings on REM open new vistas on what has been a 100-year-old mystery of "Active Sleep" using the original name given to REM, (Denisova & Figurin, 1926). This name is descriptive of a purpose of this stage, which the name "REM" is not. On the questions raised by Tsai et al, this recognition of a wæc function of REM-W, the Wæcnan-state, may contribute to their insight. Bloomberg et al recent catalogue of creatures with REM-W made me wonder if every one listed in their study, (Blumberg et al, 2020), will be

found to enjoy the REM-W benefit of excess oxygenation as found by the Tsai et al research team? I'll guess it does. Is REM-W wake, or is it sleep, or does it alternate? Such questions may float or sink on a deeper question: What is consciousness in theory and reality? The two main theories of consciousness in contention at present are named Integrated Information Theory (IIT) and Global Neuronal Workplace Theory (GNWT). Very recently, the results of a 7-year study to settle the debate between both sets of proponents was put to the test, and both theories failed…! This study is reported in a recent publication, with open access, in the journal, Nature, (Cogitate Consortium, 2025). We appear to have two main types of consistent consciousness: Wake and REM-W.

8. Disclosure Statement

This is my fifth theoretical essay on dreams. They are based on information gathered from scientific meetings, from one-on-one conversations with scholars in the field of dreams, from research publications, of course from dreamers, especially from accident victims with nightmares in my law practice, and finally, from introspection on my own dreams for some 73 years, beginning when I "saw the light" at age 8. Although I was not aware of the publications by Rial when I conceived the concept of the REM-Wæcnan-state in relation to the Tsai et al discovery, (one limitation of a law degree), I was directed to this outstanding work of Rial et al by a dream scholar I greatly admire, who noticed several more areas in this essay where I had unwittingly presumed the reader would read my mind. Thanks to her, I was able to fix several places in my text. No animal research mentioned was performed by me in preparation of this work. I did and do collect dream reports in my daily existence before during and after my Canadian legal practice (1969-2016) where many of my injured clients reported nightmares and dreams of the incident or accident. I do reference collection of dreams. Some dreams mentioned may be identified as historic reports and are in the public domain, and for others, identifying characteristics of the dreamer are absent, or consent was obtained. No funding was received and I have no financial disclosures to report. I declare there are no conflicting interests.

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