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The death of Gregory Bateson, or why linguists should study language at the end of life

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ABSTRACT

Linguists study language and language use in a range of settings and populations, yet they have not studied language, interaction, and communication behaviors and functions of the dying. This article argues that they should, using an account of the death of Gregory Bateson to make concrete the questions that could be asked, then showing some of the theoretical and practical contributions that the answers might make. The goal of such an endeavor would be to respectfully contribute a linguistic perspective to a core and truly universal human experience.

1. Introduction

To judge from the scholarly literature, linguists have been uninterested in language, communication, and interaction at the very end of life. This is curious, because a range of linguistic phenomena occur during the fundamental but regrettably unavoidable human experience called natural dying or illness dying (meaning that it is not caused by suicide, accident, homicide, or combat), and the patterning of these phenomena could benefit from the attention of language scientists.

Here I argue that these phenomena deserve further examination for myriad theoretical and applied reasons, with the goal of creating a synchronic prospective description of linguistic and interactional (verbal or non-verbal) processes and abilities across the three main trajectories of dying (cancer, dementia/frailty, and organ failure; see Murray et al., 2005) that 1) links timepoints to linguistic behaviors and communicative functionality; 2) links sedation practices, underlying medical conditions, settings, and demographics to behaviors and functionality; and 3) would shed light on the intersection between cultural practice and organic functioning. Achieving this description would require overcoming often substantial cultural and infrastructural obstacles. However, this effort would fortunately be aided by shifting attitudes about the study of death and dying and the increased need, given aging populations, to better understand the linguistic dimensions of this profound aspect of existence.

2. The death of Gregory Bateson

Illustrating these themes requires a concrete, detailed example. In 1980, Mary Catherine Bateson published an account of the death of her father, Gregory Bateson, from earlier that year (Bateson, 1980). On July 2, Bateson was moved from the University of California Hospital to the San Francisco Zen Center, after a brief bout of shingle-related pain and pneumonia; two years earlier he had been diagnosed with lung cancer, which was in remission. He had no neurological disease, but he was

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tired and beginning to withdraw. He was joined by friends, family members, and staff of the Zen center, and he was interacting with them, eating cheese and drinking sherry. Later in the day, his breathing became deep and labored, which his daughter compared to the sound of "drowning." On July 3, he spoke once in a while, and made "gestures of affection and recognition, but much of what he said was blurred and unintelligible." He also "spoke to others he seemed to see around the bed and once or twice asked whether a particular person was indeed present or only a dream." That evening, Jerry Brown, the current governor of California, came to the room. Bateson "recognised him and stretched his hand out to greet him, calling him by name." Late that night and into the morning hours of July 4, Bateson continued to be responsive, though non-verbally. "He still smiled and responded to a hand clasp, or would draw a hand to his lips," his daughter remembered. By mid morning, he was unresponsive, his pupils dilated, and his breathing slowed and then finally stopped.

This appears to be a typical account of a prototypical good death, at least in Western terms: Bateson seemed to be painless and free of discomfort, he was surrounded by loved ones, and he was guided to death by music, touch, and rhythm. Another sympathetic account was written by his student, Stephen Nachmanovitch (Nachmanovitch, 1984). The description can not and should not be treated as data, but I use it here to make concrete nine of the linguistic topics available for further investigation:

2.1. The trajectory of change

In fewer than three days, Bateson went from interacting in speech (presumably with full utterances), to unintelligible muttering, to speaking only names, to reacting to stimuli non-verbally (with smiles and touch). An immediate question is why the changes should happen in this sequence, and whether or not they always do.

It is known that functional declines at the end of life (broadly speaking, not specifically about language and cognition) are not always linear. For example, health care staff sometimes report what is known as a "death rally" or "lightning up," defined as a brief period of lucidity in the patient, followed by a rapid decline (Macleod, 2009). This does not appear to have happened in Bateson's case. Such instances are apparently rare — Macleod (2009) reported attending 100 consecutive deaths in a New Zealand hospice and witnessing only 6 instances of "lightning up." More recently Lim et al. (2020) reported 6 cases out of 338 observed deaths in a hospital setting. Further confounding is the prevalence of sedation in medicalized contexts, which may explain its relatively low frequency (Macleod, 2009: 514).

However, Macleod (2009) suggests that "lightning up" might be a manifestation of delirium, which frequently. It has been reported to occur in 80% of patients dying of malignant illness within 48 h of their death (Macleod, 2009; Lawlor et al., 2000). Delirium is a complex condition with many causes (Maldonado, 2017; Watt et al., 2019); similarly, its linguistic manifestations are diverse, as well. In some forms, people talk rapidly and nonsensically; in others they have difficulty finding words and also understanding them (Leonard et al., 2011). According to his daughter's account, Bateson experienced two bouts with delirium, one while at UC Hospital the previous month. He had been on "relatively frequent and large doses of morphine," which left him "blurred and disoriented." She also notes that "much of his talk was metaphorical." The other instance occurred on July 3rd, the day before his death, when he appeared to be hallucinating the presence of other people. The proper diagnosis of delirium is important in all post-operative care and particularly in palliative situations, as are indications to family members that nonsensical speaking should not be interpreted as if it were coming from a fully competent communicator.

2.2. Utterance types

Another salient question might be, does the type of utterance change as death approaches? Health communications research has looked at how people talk about death when they are dying (e.g., Eliott, J. and Olver, I. 2007; Bergenholtz et al., 2020; Maynard et al., 2016; Gramling and Gramling, 2019), but such research focuses on content and less on the form that these utterances, whether spoken or signed, have taken. Given that memory representations are strongest for lexical items and events with affective associations (though what produces this effect remain under discussion; see Schmidt, 2012; Schmidt and Schmidt 2016; Riegel et al., 2016), it is notable that the last thing Bateson is reported to have spoken is the name of Jerry Brown. This would be a banal last word for a thinker like Gregory Bateson, but it seems to have psycholinguistic motivation. Nachmanovitch (1984) notes his verbal exchange with Bateson that appears later that Brown's visit; see below on preservation of turn-taking.

Another possible typical utterance type might be formulaic language, which Wray and Perkins (2000) defined as a "a sequence, continuous or discontinuous, of words or other meaning elements, which is, or appears to be, prefabricated: that is, stored and retrieved whole from memory at the time of use, rather than being subject to generation or analysis by the language grammar." Formulaic sequences are frequent in the speech of people in the late stages of Alzheimer's disease and well-documented in the speech of people with aphasia (Van Lancker Sidtis and Postman, 2006; Bridges and Sidtis, 2013). It is reasonable to expect them to appear at the very end of life as well, given that they are easier to process and recall (Wray 2012). However, preservation of phrases by people dying of cancer and organ failure do not appear to have been documented. Tracking formulaic language in cases of neurological insult helps to determine the preservation of lexical access and syntactic structure, and some asymmetrical preservation might also be expected in phases of dying. In all cases, distinguishing between "novel" and formulaic language can be important for judgments about capacity to participate in care decisions. But whether

communication is "novel" or "formulaic," recognizing the pragmatic functions of formulaic phrases may aid recognition of a speaker's preservation of their communicative agency.

We might be expected to assume that individual variation in language use persists into phases of dying and that formal changes in utterances are due more to demographic or idiosyncratic factors. At the same time, it is assumed that disordered language continues to be disordered, but in what fashion and for how long is not noted. The rigidity and stability of these categories appear to be impoverished at the end of life, but it would be interesting to ascertain how. However, locating the psycholinguistic limits of certain types of expressions might help interlocutors understand the pragmatic limits of speakers and situations, helping caregivers structure statements and questions appropriately as well as interpret utterances from the dying person. As in the case of delirium, providing an evidence base for liminal, emotionally challenging sociopragmatic situations might enhance communication.

2.3. Multi-modality

Also notable are the multi-modal nature of Bateson's behaviors. He reaches for Jerry Brown while saying his name, and he brings others' hands to his lips. Quite possibly more happened that were omitted from the narrative. We might wonder how verbal and non-verbal behaviors pattern in such circumstances, and whether or not those patterns can be elucidated in terms of multimodal structures at other time of life. We might also be interested in patterns of preservation of these abilities, in the same way that neurological insults impact syntax or verbal fluency.

The complex structure of silence also reveals itself in these circumstances. From 1900 to 1904, Canadian physician William Osler conducted observations on 486 deaths at Johns Hopkins Hospital. Though the study was originally done to determine the degree to which people died in physical, emotional, or physical discomfort (Osler, 1904; Mueller, 2007), the original data were reviewed for linguistic content (Erard, 2021a). This analysis showed a range of observed and recorded phenomena, from speaking, moaning, delirium, to seeming intention to speak, but the most frequent observations were that deaths were "quiet" (Erard, 2021a). It is important to remember that silence can also represent an intentional communicative choice, in addition to marking a continuum of endings (e.g., the end of a conversational turn, of verbal production, and/or of responsiveness).

2.4. Preservation of turn-taking

What appears to be most preserved (assuming that the account of the linear decline is accurate) is Bateson's turn-taking behavior. Turn-taking is "characterized by a reciprocal exchange of alternating, short and flexible turns between two or more interactants" (Pika et al., 2018). For Bateson, the last instances of turn-taking are his responsiveness until several hours before his death. The decline of this ability might be considered a predicted indication of physical weakness. We certainly do not know enough information about time latency or other features of turn-taking in that setting. However, in general, turn-taking is one of the most durable substrates of back-and-forth multi-party communication which structures both verbal and non-verbal interaction across the animal kingdom (Pika et al., 2018). It is also acquired by human infants as early as two weeks of age, before other social abilities come online. Mary Catherine Bateson called this turn-taking mode "protoconversation" in her 1975 study of mother-infant interactions (Bateson, 1975). The durability of turn-taking suggests that it is accurate to characterize language as a layering of overlapping layers of abilities, which raises the further question that they may be lost somewhat in the order that they were acquired (a la Jakobson's regression hypothesis; on which, see below). There is a folk notion that for dying people "hearing is the last sense to go," which seems to have been confirmed with recent EEG studies (Blundon et al., 2020). However, the only way for this to be verified absent brain monitoring equipment is if the dying person responds in a visible way. Therefore, more accurately the verifiable last ability is responsiveness in a turn — the structure of protoconversation, in other words.

2.5. Canonical "last words"

What was Bateson's last word? In her account, M.C. Bateson seems unconcerned with this, which contrasts sharply with the culture of dying in Western cultures, which has taken a strong interest in the dying utterances of famous and not-so-famous people for hundreds of years. In the canonical sense, the last word is a "final, self-validating articulation of consciousness in extremis" (Guthke 1992:4). A "last word" belongs more to literary genres and perhaps family stories than authentic, empirically verifiable accounts. But it may be more accurate to say that in Bateson's case, his responsiveness and turn-taking behaviors, not any lexical production, were the true final moments of a "consciousness in extremis." This may hold for many other people as well. There is support for this in the medical literature, where decreased responsiveness to verbal stimuli is associated with impending death within three days (Hui et al., 2015). This raises questions about the structure and availability of meanings, the preservation of communicative intent, and the recognition of communicative agency by observers. This, in turn, raises another important point:

2.6. An interactional ecology

It is necessary to recognize that any dying person's multimodal communications are not monologic broadcasts, just as language use at other points in life are not. The dying person is a participant in a social scene, which constitutes the meaningful activity in the setting. No communicative behavior at the deathbed occurs or can be noted unless one or more observant people gathered at the bedside and kept attentive vigil—that is, unless they possess cultural scripts of dying that involve communicating with and interacting with the dying person, and attributing communicative agency to them. In Gregory Bateson's case, his daughter, wife, friends, and Zen Center staff were present, and many of Bateson's behaviors occur in response to others. Bateson himself might have appreciated how richer this interactional ecology is than the usual account of atomistic, decontextualized "last words."

How attributions of communicative agency change over time and how people perceive, negotiate, and transfer the communicative agency of a dying person requires an ethnography of speaking approach. Such scenes will be familiar to linguistic anthropologists and others who study language socialization as settings in which the personhood of an individual is performed and negotiated through their language use and the language abilities of other participants in the setting. Specific deaths, certain ways of dying, and cultural scripts for "good deaths" could be studied through the lens of language de-socialization, in which, to paraphrase Schieffelin (1990:15), "the process of *losing language* is deeply affected by the process of becoming *a less competent* member of society" (modifications in italics).

2.7. Interpreting the ambiguous

One element of language de-socialization within this ecology is the pragmatics of disambiguation, which can be controversial in situations where people's control of signaling (whether vocal or manual) is variable. In general, we humans must work hard to gain conscious control of vocalizations that connect us to our mammalian evolutionary history, such as cries and moans, and that are controlled by the limbic system. Yet it can be unclear whether vocalizations are limbic or intentional, particularly when there is little possibility of clarification, and the willingness to extend a pragmatic generosity depends on attitudes and ideas about the dying.

Consider the discussion that took place in 2012 on AllNurses.com, a contemporary nursing forum, where nurses described increasing a dose of sedative to quiet patients' moaning (also called "expiratory vocalizations"), on the assumption that the moans were limbic expressions of pain, not cortically-controlled attempts to interact. As clinicians and family members can explain, reacting to expiratory moans is one time when the outcomes of interpretive ambiguity have implications for care decisions. Previous discussions of the linguistic dimensions of expressions of pain focus on cross-linguistic and cross-linguistic circumstances (Bouchard, 2014) as well as with people with dementia (e.g., Oosterman et al., 2016; Hadjistavropoulos et al., 2014), where considerable research has been done on use of facial expressions. It is clear this approach needs to be broadened to interpretation of liminal expressions in medical cultures (for more on "liminal productions," see below).

2.8. The limits of conversational repair

For most language users across the lifespan, language use takes place in settings and for purpose where physical abilities, communicative intention, and interactive purpose are either clear or can be clarified (via mechanism of conversational repair, for instance). But the deathbed seems to be a place where physical ability (can someone signal?), communicative intent (can someone mean to signal?), and interactive instinct (does someone want to signal?) are not necessarily clear, cannot be clarified, and cannot be assumed. Language at the very end of life is not the only place where this occurs; another prominent one is in the territory between canonical babbling and the emergence of first words. In the case of young children, however, their powers of social interaction are increasing. In the case of the dying, one could conceptualize each of those three dimensions as a cline, then explore how each relates with the other as they change. There is another cline: the attention of a receiver/interlocutor in tangling and disentangling the ability, intent, and instinct dimensions from any production or signal. By "attention" I mean the amount of interpretive energy one is willing to direct at a signal, as well as the degree to which one would attribute communicative agency to the dying person.

2.9. Multilingual productions

Ambiguity, difficulty of repair, and the overall interactional ecology must also take multilingual repertoires into account. In Bateson's case, the only languages used were spoken English. A native speaker of English, Bateson likely had proficiencies in other languages, but they did not emerge (or were not noted by his daughter). In addition to a range of multi-modal behavior, it is also important to note patterns around multilingual language use. Do these share similarities with patterns of L1 and L2 attrition in stroke?

3. The death of Goethe

An older, famous deathbed scene echoes several of the topics that were laid out above, suggesting an approach in which such accounts are re-read from a linguistic perspective. The death of German romantic poet Johan Wolfang Goethe was retold in the 1855 biography by George Henry Lewes, *Life of Goethe*. Traditionally, Goethe's last words have circulated as the German *mehr licht*, or "more light" (though a significant subfield of Goethe studies exists to referee competing claims about other candidates, such as "open the shutter in the bedroom so that more light can come in" and "you didn't put sugar in the wine, did you?" (Guthke, 1992:83) As in the cases of other famous words, the issue that continually arises is their epistemic status: was "*mehr licht*" an invention? Lewes's account suggests that linguists could help ascertain the psycholinguistic plausibility of the reported behaviors. As Lewes wrote, "[Goethe] continued to express himself by signs, drawing letters with his forefinger in the air while he had strength; and finally, as life ebbed, drawing figures slowly on the shawl which covered his legs" (Kaines, 1866:149–150). Evidently, the word (both spoken and written) was privileged over gesture, so "*mehr licht*" (or some other utterance) became enshrined as (one of) Goethe's last words by observers, the interlocutors, and the caregivers, while the tracings in the air had no linguistic status and were not memorialized. Is there a place in a theory of language for these finger tracings? Is there a place in a theory of language for liminal productions whose status as intentional communication is ambiguous? And where do we fit the attempts to interpret ambiguous utterances as intentionally meaningful?

Thus far, I have discussed several topics of potential interest to linguists raised by the Bateson and Goethe descriptions. For linguists to pursue these areas further in regards to death and dying requires overcoming some barriers, as I discuss here.

4. Barriers

4.1. Taboo

In some cultures, discussing death is taboo. Turning dying people into scientific subjects may make others uncomfortable, especially if observers, recording equipment, or other methodological techniques seem invasive. Even among academics, those who study death and dying risk being considered morbid by their colleagues and superiors, and discussing the topic can provoke distress among listeners. However, in linguistics, what keeps people from studying dying people may be less a matter of taboo than the invisibility of the subject, given that the center of theoretical gravity concerns language acquisition and development, that linguistics has a foundational concern with beginnings and origins, and that salient populations of interest (e.g., babies) are relatively easy to contact and emotionally and psychologically appealing. Another culture-related problem is the topic's association with the study of near-death experiences (NDEs), which has expanded into a sizable literature since it was popularized in the 1970s. Legitimate scientists may not want to be included in a field perceived to be pseudoscientific, even in order to develop secular, materialist understandings of these phenomena.

4.2. Research realities

Other significant barriers lay in overcoming practical matters of research: gaining access to a population, getting ethical approval, and getting funding. Linguists and anthropologists gain access to all sorts of communities, in some cases because researchers belong to those communities, in others because they can trade things of value (such as access to speakers/transcribers in exchange for language revitalization materials, in the case of minority languages). To observe settings where people die, linguists could learn from medical anthropologists, applied linguists, and speech language pathologists about how to build trust with medical institutions and doctors as well as contacting people dying in community settings and health care providers in that setting, both of which can take considerable amount of time. Reassuring doctors and nurses that a linguist or anthropologist does not pose a threat to their professional territory should be a primary goal.

The barrier of ethical approval may exist more people's minds than in actual practice; medical researchers in fact gain ethical approval for many studies that do not directly improve care for patients, including with the dying. A recent example is Blundon et al. (2020), an EEG study of 13 dying patients' acoustic processing abilities in order to gain insight into the amount of awareness that dying people have. Ethics approval for this study came from the University of British Columbia Behavioral Research Ethics Board. Notably, hospice patients "explicitly extended their consent to the time when they became unresponsive" (Blundon et al., 2020: 8). This study appears to have been funded internally; otherwise, funding thanatolinguistic projects might prove challenging, especially because the research that linguists call descriptive might be perceived negatively by practitioners in other fields.

A further problem is that funding and research attention have flowed toward cancer treatment, even though globally more people die of cardiovascular disease in all age groups than from cancer (https://ourworldindata.org/causes-of-death). In 2016 in the US, the leading cause of death for people ages 45–62 was cancer, though for those 65 and older heart disease, diabetes, kidney disease, and chronic lower respiratory diseases were more frequent than cancer (Heron, 2018). One reason for the disproportionate knowledge about cancer patients is, at least in the United States, cancer receives research funding disproportionate to its disease burden (Moses et al., 2015). Clearly, there is a need for linguists to study a variety of populations with better tools.

Given this dynamic, meeting the need to understand communication needs of patients dying along the other two main trajectories (organ failure and frailty/dementia) may be difficult. These realities may spur innovative approaches, such as text-

mining electronic health records over very large samples of patients for descriptions of language behavior, interactions, medicines and dosages, and underlying conditions.

4.3. Methodological issues

Such a text-mining study might mitigate the methodological problem that a person's death is not foretold, so knowing when to begin observations is not clear. Another issue lies in the fact that people live with neurological changes that differ from the causes of death; for instance, a person who has suffered a stroke and has aphasia may die of a non-brain cancer or organ failure. Separating these populations is a complex issue. Similarly, not all people who die are old; should a thanatolinguistics separate populations by age as well as underlying condition? If so, what is the justification? A belief among researchers is that each death is unique, and so generalizations across deaths are hard to make (Erard, 2021b). This is less a methodological issue than an *a priori* belief about death and dying which may not be sustained.

5. Reasons for pursuing language at the end of life

Despite these cultural and methodological obstacles, there are important reasons why linguists should pursue questions about language and interaction at the end of life. First, there is limited published work in this area, so it is an open frontier. Second, it stands to make theoretical contributions to the understanding of language. Third, it can provide practical aid that results in improved patient care and communications, helping to make health care truly "patient-centered." Fourth, scientists need to participate in research on a topic where pseudoscientists have long been active. Fifth, scientific illumination about the normal range of language and interaction behaviors at the end of life can lighten the culture-bound expectations around death and dying that may originate in eras where modes of dying differed substantially from the present.

5.1. Underdescribed phenomena

There are no scientific descriptions of the types or frequencies of language, interaction, and communicative behavior of dying people as a single population from a linguistic perspective. Linguistic anthropological accounts of scenes of dying in any culture; sociopragmatic studies or conversational analysis of death bed interactions; assessments from a linguistic perspective of canonical last words; taxonomies of the functions of language; measures of utterance length and type; measures of fluency; the integrity and decay of universal and culturally-specific conversational and interactional resources; people's accommodation to communication in stressful settings and with impaired communicators; exploration of multilingual phenomena on the deathbed; linguistic dimensions of "lightning up"; even the degree to which work on the neurological effects of anesthesia, language-specific degenerative diseases, and other topics determines the linguistic and interactional resources that dying people possess — the topics of a putative thanatolinguistics are varied and numerous.

Research reported in the medical and psychological literature often touches on language, but the descriptions are unsuitable for a linguist's purposes. This research depends on clinical scales meant for busy clinicians (e.g., Morita et al., 2001; Hui et al., 2015). As a result, the phenomena are often underdescribed. For example, Morita et al. (2001) distinguishes "simple" from "complex" communication solely on the basis of utterance length. It also privileges vocal language and ignores other modalities. In another study, 34% of cancer patients were reported to be able to "speak lucidly" in the last 3 days of life (Turner et al., 1996). Moreover, it was reported to be important for patients to do so, because they found "dignity" in maintaining such functions. However, "speak lucidly" was not adequately defined, and other communication modalities for maintaining dignity do not appear to have been explored. Speaking lucidly was also categorized as a "personal function," along with "continence of urine" and "continence of stool." Here, again, the vocal modality is privileged. Clearly, such problematic conceptions of language do not come close to what linguists would bring to these circumstances and populations. A clinician might say that as long as positive outcomes are achieved, more precise conceptions of these dimensions are irrelevant. But it matters greatly that "lucid" communication is conceptualized precisely in order to ensure that participants in a culture of communication, especially in a patient-centered medical system, share stable models of communicative agency. It is also critical that participants in these scenes have access to accommodations in order to preserve communicative agency while abilities to speak, find words, hear and remember decline. In other words, achieving successful communication is not a binary value but exists on a cline, which depends greatly on the capacity of interlocutors, as well.

The existing literature which happens to explore aspects of language and communication at the end of life has other drawbacks. For example, psychological approaches tend to only use measures of verbal fluency (via a word-generating task) ((Small et al., 2003), not of syntactic structure, utterance completeness, utterance type, or interactive integrity. There are large literatures on neurodegenerative disorders of speech and language (DeLeon et al., 2020), language and normal aging (Kemper et al., (Kemper et al., 2001; Kemper et al., 2011; Riley et al., 2005; Engelman 2010; Burke and Shafto, 2004), and language attrition (Seliger and Vago, 1991; Köpke, et al., 2007; Schmid, 2013), but even with longitudinal study designs, these approaches do not follow individuals or cohorts all the way to the end of life. Rather than a topic of interest, the death of participants has been called a "mortality effect" (Hutz, 2004).

Some work in applied linguistics has been done on patient-doctor communications at the end of life. This research often uses a medical definition of "end of life," meaning the point at which prognosis is terminal because all curative options have been exhausted. (In fact "end of life" is a variable term with no single accepted medical definition.) The patients' speech and

communication is therefore not necessarily indicative of the physiological end. These studies are usually directed at improving clinician practice and patient experience, which is used to justify the observer's presence, thereby gaining ethical approval and perhaps funding. In itself, this is not a bad thing. (See below about research barriers.) However, it means that basic descriptive research on patients remains to be done.

Rather than looking at language at "end of life," it might be better to use evidence on trajectories of functional decline (Morgan et al., 2019). A linguist could expand the range of language and communicative functions to be studied. One trajectory features slow decline until the last 14 days of life, at which point it proceeds rapidly, and another has a slower, more stable rate of decline, followed by rapid decline in the last two weeks. This taxonomy suggests that the last 14 days might be a relevant, evidence-based period for linguistic observation. Of course, linguists cannot predict when someone will die, so the methodology more properly entails an observational protocol from some timepoint A that extends to death, then an analysis working backwards in the collected data to the timepoint at 14 days (or some other milestone). This was done in Morita et al. (2003) with retrospective study of charts of 284 terminal cancer patients. That team found that the percentage of patients who could achieve "complex communication" were 43%, 28%, and 13% at 5 days, 3 days, and 1 day before death. A major factor that impaired communication was not organic decline but high-dose opioids (Morita et al., 2003). As mentioned above, the criteria for "complex" and "simple" communication were not satisfactorily clear for a linguistic assessment. But the study is mentioned here as a methodological suggestion.

5.2. Theoretical implications

Perhaps linguists have not considered language at the very end of life because they consider there to be no theoretical implications for doing so. However, there are several theoretical perspectives to be enriched or extended by looking at language at the end of life. Two are of particular note: language over the lifespan and the pragmatics of liminal signs.

5.2.1. Language over the lifespan

The most famous theoretical offering with which linguists make sense of language over the lifepan is Roman Jakobson's regression hypothesis, an idea that he first extended in English in 1941. The hypothesis, loosely stated, is that linguistic forms that children learn first are the ones they lose last as adults in case of suffering a neurological insult. Numerous studies have tested the regression hypothesis (with aphasia Berko-Gleason, 1982; Caramazza and Zurif, 1978); in writing from early bilinguals (Håkansson, 1995); experimental data on case-marking (Jordens et al., 1989; Jordens et al., 1986). If applied to language and interaction in dying people, the regression hypothesis might predict that utterances shorten, that people retain grammatical frames even as their ability to select words begins to erode, that responses to names (particularly their own) will be preserved longer than other types of utterances (as people who are sedated appear to do (Gross et al., 2019)), and that they will vocalize non-linguistically. However, this line of inquiry can be most productive if researchers look beyond categorical linguistic structures toward a broader set of precursors and language substrates (such as turn-taking).

This would require a theory of precursors and substrates. Such a theory is provided by Steven Levinson's "interaction engine," which he defines as "a loose assemblage of various abilities, instincts and motivations, which work together to make possible the miracle of human communication" (Levinson, 2019). These are not language but are comprised of sets of communicative abilities and instincts upon which language is built. Levinson argues that evidence for these abilities arise in situations where language is curtailed or impossible, yet communicative abilities remain functional and intact. Another such situation might be in language and interaction at the very end of life.

Combining the Jakobson and Levinson theories, we might hypothesize that the earliest of these substrate communicative abilities to appear in babies would be some of the last to disappear in the dying — generally speaking, and taking into account the impact of non-linguistic factors. This contribution would require looking for turn-taking structures in patient-caregiver and patient-clinician interactions at the very end of life, while accounting for variation in cultural scripts of dying that stipulate varying degrees of interaction (and which may involve modes of interaction, as in Gregory Bateson's case, which are non-linguistic).

5.2.2. The pragmatics of liminal signs

Another component of Levinson's "interaction engine" might be the function of "liminal signs" (Dingemanse, 2020). These are defined as the variety of non-word phonetic utterances that still perform communicative work: whistles, clicks, sniffs, exhalations, play moans, and other phenomena that are "recurrently described as ambiguously conventional, borderline linguistic, semantically vague, and equivocal as to physiological or interactional causes" (2020, 3).

As we have seen, liminal signs are relevant to end-of-life language and interaction (and vice versa) because many such behaviors are produced by dying people. Such liminal signs become more important and relevant to understanding the person's state, especially as central linguistic abilities fade. The semiotic palette seems to broaden as previously dominant verbal functioning fades; observers in some cultural contexts find it worthwhile to read sighs, blinks, head movements, eye gaze, hand squeezes, and even subtle changes in the musculature of the face. Interlocutors do not solely "read" the body of a person but adjust their behavior, including their language, to these signs. All of these behaviors have the potential to become core linguistic resources in a relatively short amount of time, a shift that depends on the interpretive and receptive capacity of interlocutors. Such behaviors might operate differently in this population in another way: for Dingemanse, such signs have

utility precisely because they do not neatly fit into schema of "conventionality, intentionality, and accountability" (2020, 3). At the deathbed, these schema may themselves shift and become sites of contest, depending on a range of factors.

The moan in particular has an ambiguous status. On one hand, moaning is an accepted feature of delirium, and clinicians are trained to explain to family members that moans and groans do not necessarily indicate that a person is in pain. On the other hand, clinicians sometimes have difficulty interpreting moans. Professional experience does not necessarily provide fool-proof interpretive resources. For instance, a hospice nurse, posting in the AllNurses.com forum, described a patient at the end of her life:

> The final approx 12 hours she began a constant rhythmic expiratory moan. I hesitate to call it a moan because of the consistent rhythm. It was a constant pattern of vocalization. It did not change with positioning and she was unresponsive….My question is: what is that vocalization? I never felt it was pain, although I treated it like pain because frankly I would rather err on the side of kindness. Maybe it simply was... however it seemed so 'reflexive' rather than reactive.

By training, doctors and nurses treat patients as a set of physiological functions, but here is a nurse pausing to interrogate her interpretive abilities. A linguist could help ground this interpretation.

5.3. Opportunities for clinical application

Increasingly, speech-language pathologists in the US and Australia are working on palliative care teams to support communication by dying people, whether or not those patients have limits on language abilities (e.g., aphasia, Parkinson's, ALS) (Pollens, 2004, 2012, 2020; Chahda et al. 2017; DeZeeuw and Myers, 2020). They recognize that, "at the end of life, the ability to communicate is an important contributor to quality of life for both patients and their families and can be as important as pain relief" (DeZeeuw and Myers, 2020: 51). SLPs intervene by helping to structure communications between patients, providers and family members in order to improve care decisions, help the expression of personal and spiritual desires, and provide opportunities for "socialization, sharing and closeness with loved ones" (DeZeeuw and Myers 2020, 52). They could benefit from evidence bases about general trends and on specific populations, which would help care providers (particularly nursing staff who do not share the same cultural background as their patients) and family members get a roadmap of language and communication changes as create evidence bases about specific populations.

5.4. Where angels fear to tread

Another reason for linguists to study language at the end of life scientifically is that otherwise they risk leaving it to people with supernatural beliefs. Some people look at the language of the dying as evidence for an afterlife, and language performance is used as evidence that consciousness persists even after the end of the individual's life. The goal is not to contradict those beliefs but to offer material explanations that parallel a secular view of the world. At the same time, even the most secular linguist can hold a similar view about child language, though inversely: they look at early utterances by infants as evidence for language that precedes the biological life of the individual. This view does not have supernatural associations, however.

5.5. Cultural correction

With characteristic ease, people often hold multiple outdated or utenable beliefs about death and dying, one of which is the belief that their dying loved one will make a final utterance or proclamation immediately before expiring. This belief may originate at a time in history when life expectancy was shorter (so people had more intact cognitive abilities) and causes of death were acute (mainly accidents and infections). Living in modern industrialized countries, we die in different ways than people used to. Given increased sedation rates, later deaths, and dying in medicalized contexts, people may tend to die in silence. Thus, not hearing some "last words" from a loved one is not a personal failure but a medical reality. Linguistic research could help provide a much-needed corrective to understandings of what is normal and what is not. Again, it is not necessary to have a baby in order to access substantial amounts of information for scientific and non-scientific audiences about language acquisition. Outside of a few books urging "final conversations," most information about language and communication at the deathbed is available on a need-to-know basis from palliative care specialists, hospice staff, and chaplains.

6. Conclusion

We will all die someday. Along that journey, we may be so honored as to accompany others as they die. Gregory Bateson was an anthropologist whose intellectual legacy included an expansion of understandings of communication, while Mary Catherine Bateson, also a cultural anthropologist, studied mother-infant interactions and established the importance of studying early language development in interactional context (Bateson, 1975). This background makes it reasonable for one to think that they would each applaud careful inquiries into the deathbed as an interactional context. It has long seemed natural for the language-minded scientist to document the language development of their offspring or babies and children in proximity; indeed, in the late 19th century, this impulse seeded contemporary child language studies in all their

experimental, observational, and data-intensive forms. The same impulse, respectfully and discretely deployed with the dying, could seed a new field of study that would expand our notions of language, enable us to track the impact of changes to how and where we die, and inform our practices of care.

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