Case Study of Factors Confounding Linguistic Research Findings: Lessons from the 2017 Mahican Language Revitalization Project

Robert E. Shubinski, MD

The scientific method, based on collecting data, formulating hypotheses, and deriving conclusions from study protocols of various designs represents humanity's best attempt at improving our understanding of ourselves and our universe.[1] The system is not flawless because of defects in the ways studies are designed and the mishandling of data due to "human factors" composed of cognitive biases, illusions, and, in some cases fraud, all of which may lead to misinformation or disinformation. Reputable journals provide some measure of quality control, using a peer review process prior to publication. Despite this, numerous studies get published only to be retracted later. Many medical papers routinely report findings of studies as potentially contributory but warn that conclusions are tentative, pending additional research to replicate the experiments. Replicating studies however rarely occur. Poor quality research, which is later retracted or contradicted by follow-up studies, harm our society by undermining the public's trust in mainstream science.[2]

Linguistics is a science with many branches, and from that point of view it is comparable to the multifaceted world of medical science built around the contributions of biology, anatomy, genetics, physiology, physics, mathematics, sociology, psychology, pharmacology, and many other scientific fields. The author, who is a licensed physician by training with an intense interest in linguistics, aims to highlight some of the best critical thinking concepts gathered during the course of a lifetime of practicing medicine and applying them to the field of linguistics. The author is also an enrolled member of the Stockbridge-Munsee Community (also known as the Stockbridge-Munsee Band of Mohican Indians). The content of this paper reflects the author's views from the perspective of an indigenous linguistic researcher who considers his tribe's ancestral languages, Mahican and Munsee Delaware, as priceless historical and cultural treasures.

The 2017 Mahican language revitalization project will be used to illustrate selected issues pertinent to the topic of collecting, analyzing, and interpreting data. Many contributing factors contributed to the failure of this project to accurately reconstruct the language in the opinions of some members of the Stockbridge-Munsee Community, the tribe's Language and Culture Committee, and interested parties unaffiliated with the tribe, some of whom are linguists. The program has been "paused" to give our tribal leaders time to resolve the controversy and hopefully reboot the initiative on a more solid and verifiable scientific foundation.

Mahican is an Eastern Algonquian language once spoken by a population of tens of thousands of indigenous people in the northeastern area of North America. The first documented contact with Europeans was in 1609 when Henry Hudson sailed into their territory. Only a thousand or so monolingual Mahican speakers remained in the eighteenth century because of the dramatic and tragic loss of 90% of their population to the ravages of infectious diseases (smallpox, typhus and

measles), wars, forced removals from their lands, alcoholism, and enslavement.[3-6] Traditional cultural practices including the use of the Mahican language dwindled rapidly thereafter as a result of missionary efforts to convert the Indians to Christianity. The Mohican tribal members cannot be faulted for turning their backs on traditional ways as they embraced a new religion given the unimaginable magnitude of the losses suffered by every family of the community within recent memory. It is unknown whether the missionaries exploited these losses by branding them as a divine punishment for "heathen practices" (an example of illusory causation with spin) or not. Perhaps the surviving Mohicans arrived at that conclusion on their own. Conversion to Christianity did not put an end to the misfortunes of this once flourishing tribe. Additional declines in language use among the Mohicans occurred when indigenous children were sent to boarding schools and instructed to speak only English. A series of migrations disrupted the community culminating in the relocation of the tribe from New York state to the Wisconsin territory. In the 1840s the community became divided into two factions when the U.S. government ratified a treaty that granted American citizenship in exchange for the forfeiture of tribal membership. The treaty was repealed in 1856, but this created new problems, since those who had relinquished their tribal membership, belonging to the Citizen Party, and who had accepted a land allotment were barred from re-enrolling into the tribe by an act of Congress in 1871.[8] Those who chose to maintain a tribal affiliation were known as the Indian Party, and their population in 1867 was 147. This unfortunate situation contributed to the rapid decline in the Mahican language. By the 1890s approximately, Mahican ceased to be spoken habitually.[9] In the 20th century, only one proficient speaker remained along with a dozen of people with less-than-fluent proficiency according to the linguists who visited the community to document the Mahican language. The 14th amendment did not grant American Indians U.S. citizenship until the 1930s. Not long afterwards, the boundaries of the current reservation were established near Bowler, Wisconsin.

It is difficult to pinpoint exactly when Mahican became a severely endangered language. Many descriptors have been used to describe languages that are no longer habitually spoken, but it seems inappropriate to characterize Mahican as *extinct* since some words and phrases have been transmitted to the present-day generation by their parents and grandparents. It is also undesirable from a scientific viewpoint to lump all speakers with less-than-perfect fluency into one category as semispeakers. Ives Goddard described two categories, semispeakers and rememberers,[9] which are similar to Beth Cole's distinction between "semispeakers" (speakers who never learned the language fully) and "rusty forgetters" (once-fluent speakers whose knowledge of the language has faltered for lack of practice).[10] "Rusty rememberers" is this writer's preferred term.

According to Bernard Perley, an anthropologist, a language that is neither dead nor living could be called a "zombie language" and the fieldwork to study and document such a language could be called "zombie linguistics."[11] A living language, in Perley's view, is more than just an encoded message to be analyzed or deciphered, rather it is a deeply meaningful means for human beings to socially interact with one another.

To expand on this concept of a living language, consider the words in Italian, *"Ma, falle gli occhi neri!"* which translates to 'But make her eyes black!' This line, from the opera *Tosca*, was directed toward Mario Cavaradossi, the intimate partner of Floria Tosca, a dark-eyed woman who became jealous when she discovered him painting a portrait of a lady with blue eyes. A picnic basket full of food was nearby. She did not know that the painting was a ruse intended to aid an incarcerated political activist facing execution to escape and that the food was intended for the prisoner and not for a blue-eyed rival. Tosca only needed five words, delivered right after Mario's passionate and lengthy aria describing his love for her, to express her unspoken feelings of jealousy, hope and love, in a poignant and memorable manner.

A living language allows people to share feelings and concepts beyond their lexical meanings. Beyond the code, word choices and unconsciously coded information in the form of tone, emphasis, pauses, melodic changes in pitch, facial expressions, and gesture bring color and life to the social relationships. This is one reason why many people despise automated phone-messaging systems, which cannot replace the quality or quantity of information real people can exchange with one another.

There is a need for standardized terminology to describe languages that have lost the qualitative and quantitative aspects of interpersonal communication but clearly are not entirely dead or extinct. With regard to the status of Mahican, the author prefers the term "slumbering" language. It may be appropriate to revise and standardize descriptors used to describe languages in various stages of decline, in particular because many indigenous communities object to their language being characterized as dead, extinct, obsolescent or moribund. These labels only put salt in the wounds of historical trauma.

Mahican language examples may be found in a limited number of source materials, using a variety of orthographies. Some texts were written by fluent speakers, and other materials were transcribed by nonlinguists who poorly understood the principles and complexities of Algonquian languages. In the 1900s four well-trained linguists visited Mohican tribal members in Wisconsin and collected word lists and stories from consultants whose knowledge of the language was less than fully proficient. A detailed list and description of the sources can found in Goddard's 2008 paper.[9] Table 1 summarizes the source materials for the Mahican language. Table 2 presents the list of scholarly articles contributing to the knowledge of Mahican.

Abbreviations
[ ] cited forms; / / phonemic forms; | | author's personal morphemic analysis
1s, 2s, 3s: first, second, third person singular
1p, 2p, 3p: first, second, third person plural
Cat.: *Assembly's Catechism*[17] Q# A#
Mh: Mahican; EMh: Eastern Mahican; WMh: Western Mahican
pl: plural; sg: singular; obv: obviative
Verb types AI, II, TA, TI: animate intransitive, inanimate intransitive, transitive animate, transitive inanimate
an.: animate; inan.: inanimate

Table 1: Principal sources of Mahican language data

Author	Date	Type	Writing System	Published by author	Consultant	Transcriber's qualifications	Ref.	Notes
John Sergeant (Sgt)	1730s	Sermons, Catechism	English	Yes	Proficient speaker	Missionary	12	EMh
Johann Jacob Schmick (Sch)	1740s	Lexicon	German	No	Fluent speakers	Missionary	13	Mostly WMh
Moravian Materials	1740s	Passion text, letters, hymns	German	No	Fluent speakers	Missionary	14	WMh and EMh
Heckwelder (Hw)	? 1780s	Word list, comparative vocabulary	German	No	Unknown	Missionary	15	WMh
Johnathan Edwards, Jr. (Edw)	1788	Words, grammar, comparative vocabulary	English	Yes	Fluent speaker	Native speaker	16	EMh
Hendrick Aupaumut (HA)	1795, 1825	Biblical prose, Oral History	English	Yes	Fluent speaker	Native speaker	17, 18	High-quality resource
Barton (Bar)	1798	Comparative Vocabulary	English, German	Yes	J. Edwards, Jr., Heckwelder	Physician	19	
Jenks (J)	1804	Word list	English	Yes	Fluent speaker John Konkopot, Jr.	Native speaker	20	
Thomas Jefferson (TJ)	Bef. 1808	Word list, comparative vocabulary	English	No	Fluent speakers	U.S. president	21	
Hicks	1822	19th Psalm	English	Yes	Fluent speaker	Native speaker	22	
Morgan (Mor)	1859	Kinship terms	English	Yes	Fluent speakers Benjamin Toucey and sister	Anthropologist	23	Field work in Kansas
Prince (Pr)	1903	Story	Dakota	Yes	Fluent speaker Dennis Turkey	Nonlinguist	24	Transcribed by Estes
Truman Michelson (TM)	1914	Words lists, stories	Phonetic	No	One rusty rememberer, 11 semispeakers	Linguist	25	
Frank Siebert (FS)	1930s	Word lists	Phonetic	No	3-4 semispeakers	Physician, self-trained linguist	26	In Swadesh notes
Olive Eggan (Eggan)	1930	Word list	Phonetic	Yes	One rusty rememberer	Anthropologist	27	In Swadesh notes
Morris Swadesh (Sw)	1937-38	Field notes, partial lexicon	Phonetic	No	5-6 semispeakers	Linguist	28	

Author	Date	Type	Writing System	Published by author	Consultant	Transcriber's qualifications	Ref.	Notes
Harrington (Har)	1949	Field notes	Phonetic	No	2 semispeakers	Linguist	29	

Table 2: Scholarly works about the Mahican language

Author	Date	Topic	Type	Reference	Notes
Jones	1854	Tribal history	Book	18	Contains Mh words
Davidson	1893	Tribal history	Book	30	Documents tribal name in late 19th c.
Swadesh	1949	Published account of his fieldwork in 37-38	Scholarly article	7	
Warne	1980	Diachronic changes, phonology	Scholarly article	32	
Masthay	1980	Transcription and translation of Moravian Mahican materials	Pamphlet	33	Hymns, Passion of the Christ, misc. Moravian texts
Proulx	1983	Kinship terms	Scholarly article	34	
Masthay	1986	Word-form analysis	Scholarly article	35	
Masthay	1991	Transcription and analysis of Moravian Mahican materials	Dictionary	36	Translated German glosses to English; meticulously analyzed entries; mostly WMh
Pentland	1991	Historical phonology	Scholarly article	37	Included in Masthay's Schmick disctionary
Goddard	2008	Comprehensive review, phonology, dialects, grammar	Scholarly article	9	The go-to reference for the Mahican language

Linguistic Research Ethics

In the past sixty years, the scientific community has devoted attention to the development of ethical standards. In the not-so-distant past it was considered acceptable to hire bodysnatchers to rob graves for medical students to dissect. During World War II Josef Mengele committed atrocities in the name of medical science. Between the years 1933 and 1972, black males afflicted with syphilis were offered "free medical care" so they could be observed by researchers who deliberately failed to disclose the diagnosis to the men. The subjects of this infamous Tuskegee study were not offered effective treatment with penicillin after its discovery in 1947. Indigenous children were used as research subjects for a tuberculosis vaccine, without consent by Canadian researchers. Ethical breaches continue to occur to this day despite safeguards enforced by governmental agencies around the world. Perhaps there will always be a few unscrupulous medical and scientific researchers who will pursue their agendas with a wanton disregard for human decency. Thankfully there is a large number of researchers who have the utmost of respect for others.

Fraudulent research represents another aspect of unethical behavior that has plagued the scientific community. Websites can be consulted for updates on retracted medical papers. Unethical people, some of whom possess medical credentials, promote unsupported claims, often citing retracted or discredited studies and exaggerating the significance of inconclusive research papers usually for fame and financial gain. In some cases, it takes some knowledge of statistics and finely honed critical thinking skills to identify flaws in a study. Unsupported pseudoscientific theories and claims are surprising difficult to counter, such that even an abundance of factual references may fail to persuade people to reconsider their opinions. This phenomenon cannot be attributed to a lack of education or of awareness since it has been shown over and over again that trained physicians routinely misinterpret study findings and test results depending on how the data are presented.[39]

> Imagine a Disease A with a prevalence 0.1 percent (1 person out of every 1,000 has the disease). A test which can detect it has a false-positive rate of 5 percent. If the test result is positive, what percentage of patients have the disease? In this 2014 study, doctors were asked this question. Half of them reported that the patients would have a 95 percent chance of having Disease A.
>
> The correct answer is 2 percent.
>
> One in 1,000 people has Disease A. 999 do not have the disease, but 5 percent of them (50 people) have a false-positive result. There are 50 + 1 = 51 positive test results, but only one of those has truly detected actual disease. Thus a positive test means means that 1 out of 51 tests are true positives, which is equivalent to 2 percent.[39]

Ethical guidelines for linguists cover topics such as general professional conduct, behavior toward colleagues, and publication citations. The Linguistic Society of America (LSA) has published an *Ethics Statement* outlining the responsibilities of linguists to obtain informed consent from individual research participants and maintaining appropriate levels of confidentiality.[40] Beyond considering the ethical treatment of individuals participating in research, the LSA recommends that the effect of one's linguistic work on the community be carefully considered. Cultural awareness should guide the use of respectful labels to describe the

community and its language. Care must be taken to work in accordance with the wishes of the members of the community who should be considered as *partners* in the study and *directors* of the research.[41]

With regard to the Mahican-legacy data, much of the fieldwork of the early 20th century was done prior to the establishment of these guidelines. Morris Swadesh collected hundreds of Mahican words from four main consultants belonging to the Stockbridge Mohican Community in 1937 and 1938. Ten years later he published a paper in which he made unflattering comments about his consultants and used Mahican as an example of a language in obsolescence.[28] None of the words and phrases of his field notes were ever published.

Three other linguists conducted fieldwork in Wisconsin. None of that work was ever published by the linguists themselves. Although the materials have been made available and constitute a valuable contribution of our knowledge of the Mahican language, a full accounting of the methodology used to collect the data is lacking. Had the notes been published, we might have a better idea of how much time was spent in the community getting acclimatized to the unique sounds of the language. Such information would greatly help in the interpretation of the field notes. A published account may also have included comments from the linguists about the proficiency levels of the consultants and the degree of certainty they felt about the words they provided. A legend explaining the phonetic symbols used to transcribe words would have been included in a published version of the notes, and other skilled linguists would have had an opportunity to contribute comments about the scholarly content. Our understanding of the field notes would have been enhanced had there been remarks from contemporaneous colleagues about some of the important linguistic details, for example, correlating the ways the field linguists heard and transcribed the phonemes of Mahican based on their familiarity with other Algonquian languages. It goes almost without saying that any attempt in the modern era to extract morphological and phonological conclusions from these incomplete and unpolished 20th-century attempts to document the Mahican language must reflect a certain degree of tentativeness. That the fieldwork was done at a time when Mahican was no longer spoken habitually or proficiently only adds a layer of uncertainty to the materials gathered during this time frame.

In his seminal 2008 paper about the Mahican language, Ives Goddard duly noted the inconsistencies of data extracted from the 20th-century field notes. This is not surprising since Goddard has been an exemplary role model for respectful and collaborative community-based fieldwork long before the publication of papers or handbooks outlining ethical guidelines for linguists. The Munsee Delaware language information he collected was subsequently shared with the publication of his Ph.D. dissertation titled *The Delaware Verb*.[74] I have treasured this book and scoured it for countless hours while learning the basics of Munsee language grammar. There are scores of e-mails in a special folder of my inbox proving the extremely generous spirit of collaboration of this distinguished linguist emeritus, particular with regard to helping indigenous individuals keen on expanding their knowledge of their tribes' ancestral languages such as myself.

John O'Meara also performed community-based linguistic Munsee Delaware language research and dutifully shared his knowledge by publishing his work.[64,75] Like Dr. Goddard, Professor O'Meara has been generous with his time demonstrating a clear eagerness to collaborate with this writer, a nonprofessionally trained student of Algonquian languages, and graciously did so with the respect usually reserved to interactions with a colleague.

Unfortunately, the person hired to research and revitalize the Mahican language, a graduate student in linguistics, was not interested in a team-based approach. Repeated offers to collaborate were declined, despite having been provided extensive linguistic documentation of alternate ways of interpreting the source materials. Deviations from Goddard's insights were pointed out but in all cases were ignored. Compromises offered were also ignored such as adopting an informal surface-level orthography for novice language students while utilizing a more formal orthography for Mahican for documentary purposes. This writer's suggestion to use a writing system similar to the one in use for the tribe's other official language, Munsee Delaware, was also rejected without explanation. Instead, a partially syllabic writing system based on English phonemes was adopted and the glottal-stop symbol "ʔ" was incorporated into a language that had never had postvocalic and preobstruent glottal stops until the language was in a serious state of decline.

Comments about these issues were elicited by e-mail from the two most knowledgeable scholars of Mahican, Carl Masthay and Ives Goddard. Both noted that Eastern Mahican speakers used postvocalic /h/ and not glottal stops prior to the last stage in desuetude of Mahican. This information was shared with the hired language contractor, but it was ignored. A close look at the contractor's language work showed that more than thirty significant phonological and grammatical features were incorporated that cannot be substantiated by the source materials or that contradict analyses found in Goddard's 2008 Mahican paper.[9] These contentious features included the inclusion of the vowel /e/ not known to exist in Mahican, the regularized use of postvocalic glottal stops, the regularized elimination of the phoneme /wə/ when used as a prefix or word-initially, unattested sound rules (vowel shortening before word-final /w/), incorrect conjunct endings for some verb types, and the replacement for words historically attested with informal truncated versions of words obtained from semispeakers. Requests for explanations concerning the divergent linguistic analysis were essentially ignored. In one instance, a partial explanation was provided in which the students were cited as the determining factor for the choice of the writing system and the decision to model to revitalization on the 20th-century speech patterns. This does not reflect community collaboration since tribal members other than the language learners were not involved in these decisions, and the choices made by the students may have been different had they been informed of the lack of consistency in the speech of the semispeakers of the 20th century.

Concerns about the quality of the work by the language contractor were brought to the attention of the tribal staff and administrators by this writer and by some of the students who attended language classes teaching the reconstructed Mahican language. No action was taken because

tribal decision makers did not know what or whom to believe, citing their lack of linguistic knowledge. Students who disagreed with the way the language had been reconstructed were unable to effectively challenge any of the assertions about the morphology or phonology made by the hired language expert, who provided definitive rebuttals to their objections.

When meetings were held to discuss the concerns, a group of community members loyal to the language contractor reported that the process had been collaborative, and more information was offered about the choice to learn either "historical Mahican" or "20th-century Mahican." They had been told that adopting the newer version would honor the elders who last spoke the language. "Languages change" was often heard in the meetings held. They had no way of knowing that the linguistic data do not support the "language change" theory and that there was no established or consistent 20th-century pattern of pronunciation. Examples of the data in support of these assertions are presented throughout this paper.

The tribe ended up with a "linguist-centered" revitalization program. There was an illusion of collaboration, but *meaningful collaboration* did not occur. This breach of ethics was compounded by the fact that the language contractor was a linguist-in-training who dropped out of the linguistics graduate program sometime in 2019 but failed to disclose this information to key tribal community partners. His change in status was discovered in 2023 after inquiries were made.

There is much to be learned from this situation. Communities hoping to revitalize a dormant indigenous language need better information about whom to hire and how to hold the person in charge of researching and reconstructing their language accountable ethically, scientifically, and linguistically. Linguists need to be aware of the possibility of cognitive biases clouding their reasoning and judgment and to make preemptive arrangements for guidance and supervision.

Quality-Control Reviews

Doctors are held accountable for their medical decisions in several ways, such as peer review boards, malpractice claims, medical board sanctions, and Internet-based patient reviews. Patients have been encouraged to protect themselves from improper or negligent medical care by requesting second opinions. Protective measures such as the "patient bills of rights" and availability of patient advocates have become standard in the industry. Hospitals are accredited and regularly audited by state and federal government agencies to ensure compliance with safety and ethical rules. Redundancy is built into all aspects of medical care. Despite this, death and injuries caused by medical errors and malpractice are unacceptably high. When I was fresh out of medical school, a little more than thirty years ago, it was said that medical errors in the U.S. kill the same number of passengers as carried by one Boeing 747 *on a daily basis*. "Imagine the outcry from the public if the airline industry were to report causality rates of several hundred people per day," quipped one professor teaching on this topic. Currently the death rate is estimated to be equivalent to *two* 747s per day.[43]

Linguists entrusted with a priceless cultural and historical treasure, the ancestral language of an indigenous community, should be held accountable to the same high standards as what is expected of airline pilots and health care professionals. In all three of these professional categories, guidelines and oversight are needed, but the aviation industry is the star of this show because of a pattern of diligent and timely responsiveness to concerns about the safety of air travel.

It has been said that "failure is the best teacher," and aviation regulatory agencies have exemplified the implementation of this concept. Every accident is investigated and analyzed at great expense, and the lessons learned from every disaster are translated in practical changes in training, procedures and equipment. One prominent change occurred after two 747s collided on a runway in Tenerife, prompting aviation leaders to put an end to the tradition of allowing the captain (or the designated pilot-in-command) to dismiss or to disregard concerns raised by other crew members.[46] All pilots now receive mandatory crew resource-management training that promotes team-decision making but also incorporates awareness of cognitive biases susceptible of influencing key decisions in the cockpit. Sadly, the 1977 accident in Tenerife was not the last crash to have been attributed to the overconfidence of the pilot-in-command or to the reluctance of a crew member to challenge the authority of the most senior and experienced pilot on the plane. Nonetheless, the responsiveness of the aviation community to embrace change and to learn from their mistakes has undoubtably saved lives.

Many cognitive biases and logical fallacies could be cited as explanatory models for the failures that contributed to the Tenerife disaster. The Dunning-Kruger effect renders a person unaware of his or her cognitive shortcomings or deficits in skill sets. Psychologically, it could be the result of an exaggerated self-appraisal of one's abilities or from an underdeveloped inner critic leading in a quasi-delusional belief in one's competence and often is accompanied by a heightened level of defensiveness against accepting constructive criticism.

Quality-control measures should be considered by every community working with a linguist reconstructing their language. Some elements may require linguistic expertise, but scientific methodology oversight could be provided by people trained in any scientific discipline.

Linguistic Fieldwork Ethics

Several academic linguists have touted the merits of collaborative community-based research. Professor Keren Rice of the University of Toronto has contributed several scholarly works on the topic of ethical fieldwork, advocating "collaborative research" in lieu of the "expert subject" model.[44] Professor Rice delivered a talk in 2010 on this topic during the annual meeting of the Linguistic Society of America that highlighted the scientific value of the collaborative research model for documentary linguistics.[45] According to Rice, fieldwork in a community involves more than the completion of the "Boasian trilogy" of grammar, dictionary, and orthography. Since indigenous languages are deeply embedded into the sociocultural aspects of the community beyond the phonemes, morphemes, word order, and productive word formation

paradigms, attentiveness to these issues is equally important. An approach that Rice called "collaborative fieldwork" was proposed as a mechanism for simultaneously accomplishing the documentary and the functional components. It involves sharing the task of linguistic research between the linguist and community members. Working together, they document the language, blending sociocultural elements with the morphosyntactic components. Had collaborative fieldwork been used for the Mahican reconstruction effort, much conflict and controversy could have been avoided. It is difficult to summarize the richness of content of this article in a few short lines, and so I highly recommend taking the time to read it in full.

Collaboration involving people with different education levels and with different cultural backgrounds may be challenging, but the rewards are many. Unfortunately, in some medical practices, patients who do their own research run the risk of being gruffly reprimanded by the doctor for trespassing into a forbidden territory of medical expertise and competence. Not so in this writer's medical practice. Patients are told that a good idea will be accepted from any source. As young medical students, while studying pathology in the dark basement lab looking at slides of healthy and diseased tissue samples under the microscope, we routinely asked the janitor of the lab for help whenever we were stumped. Having worked there for many years, he knew all of the slides and how to interpret them. Whether it was cirrhosis of the liver, healthy glial brain tissue, or cardiac ischemic necrosis, he could identify the slide with just a cursory glance through the microscope. Later, after graduation, I came home to visit my family. My mother, who was a registered nurse, reminded me that I was a "green doctor" with much to learn. She recommended that I ask the nurses to teach me as much as possible whenever starting a new rotation in the hospital during my residency and reassured me that I would not appear incompetent by doing so. Quite the opposite, she told me. By asking for help I would earn their respect. I heeded this advice then as I do now and learned the value of the team-based care model.

Meaningful collaboration requires much more than possessing a willingness to communicate with team members. Highly educated professionals such as doctors, pilots, and linguists must learn to set aside any notion of intellectual superiority and replace it with the mindset of a student, always learning and continuously revising one's knowledge base. A pilot might encounter unforeseen mishaps such as changes in weather or malfunctions of equipment that could require action to avoid a crash. Pilots call this Murphy's law, "Anything that can go wrong will go wrong." Murphy was in fact a pilot, and modern aviators are taught to be mindful of ever-changing and unpredictable flying conditions. The term *situational awareness* is used in aviation to describe certain keys aspects of this concept. Responding effectively may involve learning something new, from the aircraft operating manual, from a co-pilot, from a ground-based air traffic controller or even a passenger. Pilots are trained to avoid mental attitudes of "antiauthority, impulsivity, invulnerability, machismo, and resignation,"[46] all of which have been associated with higher frequencies of crashes because they interfere with effective decision making. Doctors must be aware of their blind spots, many of which are rooted in the "personal psychology" they acquired over time by virtue of one's gender, birth order, culture of origin, personality traits, age and a myriad of other factors too numerous to elaborate in this context.

Linguistic work can be affected by all of the same factors as other professionals, and individual linguists may vary in their ability to distinguish types and durations of sounds, tone, and rhythm, attributable to biological factors affecting auditory processing, gaps in training, the confounding influence of previously encountered language patterns, and limitations inherent to the specific methodologies used to collect and analyze the language data.

Lucy Thomason's Ph.D. linguistics dissertation states, "Good linguistic methodology requires us to start out with the most elegantly spare hypotheses we can construct, and then amend them when they fail to account for the linguistic facts, or discard them altogether when they lead to logical inconsistencies."[47]

For the 2017 Mahican language project, no revisions occurred despite repeated attempts to bring data to the attention of the hired contractor. An attempt to set up a "round table approach" to review the factual linguistics findings and reach a shared understanding of how to interpret the more ambivalent aspects of the source materials was rejected, because of this writer's lack of an academic linguistic degree.

Ethics of Power Dynamics

We know that 80% of aviation disasters are linked to human factors, a term that encompasses pilot and maintenance crew errors, communication mishaps, cognitive biases, and illusions. Medical errors have become the third leading cause of death in adults. A portion of these negative outcomes stem directly from power dynamics, an unspoken pecking order making it difficult if not impossible for people on the lower end of the hierarchy to be heard, acknowledged, or taken seriously. Like doctors and pilots, linguists may be placed in positions of power and authority. As all scientific practitioners, linguists are not immune to the many-faceted pitfalls of decision-making processes that adversely affect medical professionals and aviators. A person in any profession who exerts power over others, whether it be physical, intellectual, or financial may be susceptible to exceeding the limits of his or her authority. The flight training curriculum for pilots covers human factors in great detail, but medical schools barely discuss this topic. Linguistic scientists have not neglected this topic because I was easily able to find papers and textbook chapters with content to this issue. These resources cite *institutional oversight* as a necessary but sometimes burdensome means of monitoring power relations in language research.[48]

Accountability in this area should not be optional or left to chance. Linguists, especially those involved in the research and reconstruction of slumbering or extinct languages, possess enormous power to guide the course of the research in culturally harmful ways, as has been the case for the Mahican language reconstruction project. A graduate student in linguistics was placed in charge of the project, answerable to no one. No institutional oversight or guidance was provided. No meaningful collaboration occurred. Higher standards of ethics should have been applied when they were handling such a precious commodity as the ancestral language of the Mohican community.

The linguistic literature devoted to fieldwork ethics also covers the topic of the gratuity principle, a form of giving something back to the community. The work is not supposed to harm the community. Doctors hear one mantra over and over again during medical school, internship and residency:

"Do no harm!"

It is a shortened version of the Hippocratic Oath, a solemn promise to use one's medical knowledge to benefit the patients to the best of one's ability and judgement and to do no harm or injustice to them.

It might be worthwhile to promote use of this oath among field linguists since it may be possible to paradoxically be in compliance with the linguistic gratuity principle while simultaneously causing harm within a community. Linguistic fieldwork and language reconstruction work have self-serving component in terms of obtaining data for one's professional agenda and in some cases results in a financial gain. Giving something back is a way of compensating the community in exchange for what has been taken. Awareness of the potential for harm to individuals and to a community is less explicitly mentioned in the linguistic literature.

Harm was done by the language contractor hired to reconstruct Mahican. The failure to actively collaborate with the one tribal member who possessed extensive knowledge about the Mahican language caused great personal harm to this writer and diminished the quality of the language reconstruction. Other tribal members with a passion for the Mahican language were made to feel unwelcome by the contractor when they disagreed with some of the phonological and grammatical features taught in the lessons. Even opinions from eminent scholars, Carl Masthay and Ives Goddard, were rationalized away, without offering them an opportunity for rebuttal or discussion. Harm was done to the community, creating a division among tribal members, some of whom are unable to believe that anything could be wrong with the work ethic and work quality of the person hired as their language expert. All of this stems from an unwillingness to relinquish any control over linguistic content.

Prevention may well be the best medicine. Had a peer-review process or quality-control oversight by others possessing language expertise been mandated from the onset, much controversy would have been avoided within the community. It should not be assumed that a linguist still in training or newly graduated might possess enough professional integrity to arrange for supervision by a more experienced colleague without being prompted to do so.

For collaboration to be *meaningful*, there must be a willingness on the part of the linguist to accept feedback and corrections from others combined with a means for the independent verification of data and facts. Theories of questionable validity or of a controversial nature should be represented as tenuous. Lacking this, the collaboration may turn out to be illusory, and

the process will in reality be "linguist centered" and one sided. Flexibility in the theoretical formulation of available data is desirable as is shown the following section.

Linguistic Theories

Linguists may not always agree with one another. Some are fundamentalists, and others are functionalists.[49] Chomsky's Generative Grammar and Lakoff's Cognitive Linguistics are opposing theories of language acquisition. The Sapir-Whorf hypothesis describing the relationship of thought to the structures of language is far from universally accepted. Some believe that thought determines the structures of language, and others believe it is the other way around. Science has not resolved the mystery of how or when spoken languages originated in humans. Linguists have also produced interesting debates about language rules, some of which categorize forms in terms of right versus wrong, whereas other theories rank forms as more or less statistically probable to occur. This last concept has a parallel in the science of physics, which has trouble reconciling the complexities of probabilistic quantum mechanics with Einstein's equation-based theories describing the universe, leading to an elusive quest for a unified "theory of everything."

Developmental psychology also has many diverse and competing theories. Sigmund Freud proposed a tripartite theory of the mind composed of the id, the ego, and the superego. Freud also developed a psychosexual theory of psychological development defined by the oral, anal, oedipal, latent, and genital stages. These can be understood in terms of how children learn gratification and how they explore the world around them. Donald Winnicott believed that people develop their self-identity from the way our parents react to us. Melanie Klein pioneered a theory known as object-relations theory that explains why some people are prone to blame others for their problems (externalizers) whereas others mostly blame themselves (internalizers).

Erik Erikson described eight very useful psychological-development tasks, listed in the adjoining sidebar. Failure to master the all-important first task will influence the following stages. The first three occur in early childhood. Elementary school age children deal with stage 4 competency, and stage 5 describes early and late adolescence. The final two stages define features of adulthood.

Erikson's stages of development
Stage 1: Trust vs. Mistrust
Stage 2: Autonomy vs. Shame and Doubt
Stage 3: Initiative vs. Guilt
Stage 4: Industry vs. Inferiority
Stage 5: Identity vs. Confusion
Stage 6: Intimacy vs. Isolation
Stage 7: Generativity vs. Stagnation
Stage 8: Integrity vs. Despair

Jean Piaget gave us theories of cognitive development that describes how children progress from concrete thinking to embrace abstract concepts. Attachment theory, championed by Konrad Lorenz, highlights the importance of bonding in early childhood, a process he referred to as *imprinting*.

Salvador Minuchin formulated a theory of structural family dynamics, demonstrating the importance of defined roles and boundaries in the family system and the negative effect of favoritism among siblings, scapegoating, and family coalitions. Separation-individuation theory, proposed by Margaret Mahler, describes how toddler-age children oscillate between a desire for safety and closeness by staying close to a parent on the one hand, and a desire to explore the world by wandering away from the parent on the other hand. During adolescence this process repeats itself, when teenagers take risks to explore a world apart from their parents while simultaneously needing things from their parents. This concept is illustrated well in the title of a book about adolescence, *Get Out of My Life, but First Could You Drive Me & Cheryl to the Mall?*[31]

There are other theories not mentioned here. All of them are fascinating, but the sheer number and complexity of these theoretic frameworks can be overwhelming and bewildering. Professionals may not always agree about which theory is right or which ones are wrong. All were developed by brilliant minds.

As part of my teaching duties as an associate professor for the University of Nevada–Reno, I would discuss these theories with psychiatric doctors-in-training. Afterwards, a street map of the city of Reno would be shown. Once satisfied in the map's accuracy and usefulness, another map depicting Reno's seismic fault lines would be shown. Although its appearance differs, it is no less accurate than the street map. The same idea would be applied to a topographical map of the area or an aviation map. My goal was to get the minds of residents away from classifying the maps using right-versus-wrong thought constructs. Each type of map may be useful for different people and different situations, just like the theories of the human mind. Other scientific disciplines have struggled to find ways to reconcile opposing theoretic frameworks. Physicists have long been searching for a unified single theory of everything to breach the gaps between quantum physics and Einstein's theories.

The usefulness of the "maps" concept would then be illustrated by looking at the psychiatric symptoms of a child through the lens of each theory. Endless treatment options can be derived by formulating the case with these maps of the human mind. Play therapy could free the id from an overbearing superego. Frozen stages of development could be identified leading to supportive discussions about successfully negotiating them. Positive mirroring of a child's qualities would flow from Winnicott's model. Drawing on Klein's theory we might look for signs that the child is stuck in a world view of self-blame and find ways to put balance into those thought constructs.

Eriksonian concepts might be useful. Does basic trust need to be more firmly reinforced in order to allow the rest of the development to catch up? Might there be an excess of shame and doubt? What could be said and done to help a child get back on track toward a healthier developmental progression through the stages. A look at the case from Piaget's perspective might help us communicate with a child in accordance with indicators of cognitive development in mind.

The therapy could focus on the quality of attachments in the child's life or family structural boundaries could be strengthened. We could also formulate the case in terms of separation-individuation concepts, nutritional imbalances, sleep disturbances, the lack of physical activity, the role of more or less wholesome hobbies, nefarious effects of the social environment and the lack of capacity and opportunities for play. Eventually the prescription of pharmaceuticals could be considered. Using maps, a clinician will never run out of useful ways to intervene and promote recovery.

This diversion into the world of child psychiatry is intended to illustrate how multiple theoretical explanations of *why things are the way they are* need not be bewildering or polarizing and to demonstrate how multiple theories can be a trove of useful knowledge.

I would cautiously suggest that the same holds true in linguistics. The interpretation of a data set may improve if it is examined from the perspective of different theoretical formulations. Michael Breyl promoted the value in embracing aspects of both generativist and constructionist linguistic traditions rather than choosing a camp and denying legitimacy to the other theoretical framework.[1]

If it were possible to recruit a multidisciplinary team of linguists for a collaborative effort to analyze the data of a language through the lens of their respective specialties, it would be hard to imagine that the results would be inferior to the work of a single partially trained linguist working in isolation, as was the case for the 2017 Mahican language project.

The project suffered because of a rigid adherence to a single theoretical formulation to understand and explain the linguistic data. That hypothesis assumed that 20th-century diachronic phonological changes had occurred, resulting in a new dialect of Mahican. Morphological and grammatical anomalies in the speech of the 20th-century semispeakers, which showed obvious signs of language decay, were not taken into account. A conlang was thus created using the linguist's preferred phonological changes while retaining grammatical consistency with older sources, a paradox of logic.

The rejected historically attested phonemes were replaced with alternatives absent from the speech of fluent speakers who self-transcribed texts in the Mahican language. The changes altered the pronunciation of culturally and socially important words in a way that has proved deeply offensive to some members of the Stockbridge-Munsee Community.

An example can be found using the Mahican word for 'Thank you!' that was documented in the 18th century by fluent speaker Jonathan Edwards, Jr.[16] In the 1930s, Morris Swadesh heard this word from the consultant Julia Palmer, in an essentially identical form.[28]

(1) Comparison of 18th- and 20th-century versions of the word for 'Thanks!'
(1a) Consultant Jonathan Edwards, Jr., in 1788, self-transcribed
        i) [wneeweh] /wəni:wih/ 'thanks' (Edwards 1788)[16]
(1b) Consultant Julia Palmer in 1937-38, transcribed by Morris Swadesh

i) [wəni:wɪ]
ii) [wĕni:wɪ] (slightly different ultrashort initial vowel)
iii) [ni:wɪ] (shortened form, either murmured first syllable or informal speech form)
iv) [wəni:wɪ] 'thank you' (elicited on a different interview date)
(1c) 'Thanks!' in the 2017 Mahican reconstruction project
i) [oneewe] /one:we/
(1d) 'Thanks' in 18th-century Moravian sources of Mahican.[13],[14]
i) [oneewe] |wəni:wih|

Note in the Swadesh forms (examples 1b) that the initial phoneme is /wə/ and the vowel of the second syllable is /i:/, both of which are altered in the 2017 Mahican reconstruction project. The final syllable, consistently pronounced with /ɪ/ reflects the presence of a Proto-Eastern-Algonquian sound rule that shortens word-final long vowels. Mahican typically added a final /h/ to these shortened vowels as was specified by Edwards. This is explained in more detail in Goddard 2008.[9]

Note in (1c) that the phonemes have been altered in all three syllables by the language contractor of the Mahican project:

/wə/ > /o/
/i:/ > /e:/
/ɪ/ > /e:/

In subsequent sections of this paper a more detailed analysis of these alterations will be provided.

The datum in (1d) was attested in documents written by the members of a Moravian community, west of the traditional Mohican territory. The missionaries compiled a lexicon of Mahican words and phrases and translated hymns and biblical prose into Mahican. They also held classes teaching the Mohicans residing the community how to write words in their language using a German-based orthography. Most but not all words starting with /wə/ were transcribed using [o] or [u]. Some instances of [w] can be found. The German "e" corresponds closely to English /i/ (as in English 'eat'). German writers omitted final /h/ in most instances, since in German that would indicate a long vowel (see Goddard 2008).[9]

No 20th-century consultant spoke the word for "thank you" using an initial phoneme of /o/, but that did not stop the hired language contractor from telling his students that /one:we/ was the only correct version. The anomalous word spread across the community making its way into e-mail signatures and other documents. Although data challenging the phonetic changes were provided to the language teacher and to the hired contractor, the information was ignored. The cultural consequences to the community have been devastating, all because of the inflexibility of the language contractor to make any revisions or to even have a discussion about the issue with the tribe's official language and culture committee.

Even deeper wounds have been inflicted by another culturally important word that was altered by unsubstantiated phonological choices championed by the contractor, the Mohican tribal name. See data entries numbered (12), (13), and (14) for an additional information about this word.

(2) Mohican tribal designation
(2a) [Muhhekaneew] /mą̇hi:kani:w/ (traditional) (Edwards 1788)[30]
(2b) [Maʔeekunew] /maʔe:kʌnew/ (2017 Mahican language reconstruction project)

Note in (2b) the substitution of /h/ with a glottal stop and the replacement of /i:/ by /e:/. These changes altered the pronunciation of the name of the tribe, causing many tribal members to visibly cringe when hearing it spoken.

Twentieth-century cognates of the Mohican tribal name from contemporaneous Munsee speakers do not show these changes. Since Munsee uses the vowel /e/ as a phoneme, they would have almost certainly shifted their pronunciation in accordance with the preferences of their Mohican "elder brothers" had the changes really occurred. That their pronunciation matches the traditional Mahican paradigm provides indirect evidence that the phonology of Mahican had not changed.

(3) Munsee cognates of the Mohican tribal name
(3a) [Māhīkani(wᵃ)] /Ma:hi:kani:w/ (Michelson 1912, Kansas Munsee field notes)[73]
(3b) [Maʻīka̲n] /Mahi:kən/ (Michelson 1922, Ontario Munsee field notes)[63]

Phonological changes of the 2017 Mahican language project were rationalized based on the proposition that students would be honoring the elders by adopting their speech patterns. These speech patterns were misrepresented as homogeneous and established, whereas the source materials clearly show an inconsistent phonology during the years of 1903-1949.

In 1914, Truman Michelson wrote that "a dozen people were found who could give isolated words in the Stockbridge (Mahican) language but only one person who could dictate connected texts. About a half-dozen of such texts were obtained with difficulty. Knowledge of the language was too far gone to permit unraveling of its details. . . ."[25]

Although we still have much to learn about ways languages change at different stages of their life cycle of a language in small communities, the linguistic literature urges caution when interpreting data from semispeakers or small-sized datasets.

Nancy Dorian noted that data collected from the last speakers of a language should be assumed to be "markedly deviant" and asserted that "the last speakers of a dying language can be very misleading source of information about the grammar (and presumably also phonology and semantics) of the language they represent."[50]

Anthony Grant and David Costa acknowledged variations in a Peoria language vocabulary collected by John P. Harrington from two weak semispeakers but commented that these variations should not be attributed to the processes of regular phonological change that had been "largely suspended" because Peoria was no longer actively used in the community.[51]

John Mansfield and James Stanford highlighted the wisdom of using a large dataset to derive analytic conclusions about language variability whenever possible, while noting the practical

difficulties of this recommendation inherent to indigenous language research.[52] The paper also highlights the interconnections that link morphosyntax and phonology to sociolinguistic variabilities and liken it to an unraveling of the "local intersection of language and culture."

Parallels to medical science exist here as well. Rare diseases are harder to characterize because variability in the expression of its symptoms can be confirmed only after a large number of case reports have been published. Asserting a medical diagnosis without considering possible differential diagnoses is reckless, particularly when a given diagnosis requires a treatment associated with potentially serious adverse reactions. Medical screening tests for rare diseases must be interpreted with caution. Positive results are tentative until confirmed by more specific tests, and even then diagnostic uncertainty may persist. Handling uncertainty is routine in the day-to-day practice of medicine. Scientific knowledge constantly changes as new data become available, and sometimes new data arise simply from a rediscovery or reinterpretation of older information.

Overview of Scientific Research Flaws, Biases, and Fallacies

A large number of factors may affect the quality and accuracy of research findings. From the consumer perspective, critical thinking skills based on these factors are necessary for one to properly assess a study or a test result. False-positive findings (type I errors) and false negatives (type II errors) may exist in research studies or in tests whether it is from the laboratory analysis of a blood sample to screen for a disease or from the detection of phonemes of words elicited by an consultant making use of a linguist's hearing apparatus. Not all errors may be attributed to faulty or scant data, since the methodology used can have a significant effect on the outcome. An abnormal blood test could be attributable to defective testing equipment, use of an incorrect chemical reactant, a misidentified blood sample vial, a random temporary biological fluctuation or a bona fide abnormality. A single abnormal test result should not be considered conclusive, and proper medical decision making requires most test results to be verified or repeated.

The use of critical thinking skills may draw awareness to the possibility of false positives and false negatives amid the valid results, but common sense must be used to guide decisions using test results of uncertain accuracy. When one is dealing with a bomb threat, it is safer to assume that it is not a false alarm because if the threat turns out to be real the consequences could be disastrous. On the other hand, a suspicious biopsy result *should* be considered as a false positive, warranting diagnostic confirmation by obtaining additional tests. It is safer to delay potentially harmful treatment for a condition that does not warrant it.

Random fluctuations can lead to erroneous conclusions, and so scientists rely on statistical analysis to instill some degree of confidence in the results. The system is far from foolproof because the equations become meaningless if defective data were analyzed or if the study's methodology were flawed.

The standard method for confirming the accuracy of a test or study result is to replicate it, optimally by an independent scientific team. The more studies published, the more likely it will be to obtain accurate results. Negatives studies that are unpublished create the illusion that the results of published studies are more impressive than they actually are. Said a different way, the team approach when it come to publications produces vastly superior results for an individual research project, and a group of teams producing multiple studies on a given topic will provide even better results, even if some studies are "negative."

Illusions and cognitive biases can affect the research at every stage, from inception to interpretation of results. Most people are familiar with optical illusions, but any information we receive from the outside world can be interpreted by our brains erroneously.

Temperature sensing is an example of an illusion that is not optical. Physiologically human beings do not have built-in thermometers, but we do have sensors that detect the *transfer of heat* in and out from our bodies. This is why touching a metal surface feels much cooler than a wood object in the same room. The temperature difference seems real to us, but a thermometer would show similar readings for both objects, proving that neither is warmer or cooler than the other. This illusion spills over to the words we would use that are technically inaccurate when it comes to temperature matters. Whenever my children would say that they were *cold*, I would invariably correct them by informing them that they were in fact *lukewarm*, approximately 98.6 degrees Fahrenheit or 37 degrees Celsius, and instructed them to say that they were simply exchanging thermal energy with the environment more intensely than usual. It was all in good fun, and, yes, I'd get eye rolls.

Visuospatial illusions that cause an airplane pilot to believe that their aircraft is turning or sinking are a significant cause of crashes when flying in low-visibility conditions. This was determined to be the root cause of JFK, Jr.'s fatal accident by the committee charged with its investigation.

A cognitive bias is just another type of illusion created in our minds and altering the way we view reality in a very convincing manner.

Auditory illusions are relevant to linguistic studies. The McGurk effect, or fusion illusion, may alter the perception of certain sounds such as /l/ and /r/ for monolingual Japanese speakers.[53] Henry McGurk and John MacDonald co-authored a study that demonstrated that a video showing a person saying "gagaga" with a dubbed audio track saying "bababa" will often be heard as "dadada" even by people who are aware of the mismatched visual and auditory data.[54] It is especially relevant that the illusion is not perceived by a certain percentage of viewers because of individual differences in sound perception. It is possible to predict approximately what percentage of people will be subject to the illusion depending on their native language as well.[55]

Consequently, relying on acoustic information alone may skew the data assessment. Experienced linguist Ives Goddard noted that visual data can aid the perception of sound detections with his

description of how the observation of lip rounding had been helpful in detecting the presence of a /w/ in words collected during fieldwork in a community of Munsee Delaware speakers.[56]

Perceptual factors affecting the quality of phonological data are central to the debate about the Mahican reconstruction effort. Linguist Janet Warne noted in 1980 that it is "particularly difficult" to interpret the Mahican vowels in the Moravian documents because of influences of the German-language orthography and their personal speech habits.[32] These Moravian documents were undoubtably easily interpreted by the authors themselves and contemporaneous community members, but readers and linguistic researchers in the modern era struggle to decipher the vowel inconsistencies and the unexplained diacritics of these texts.

Another type of illusion was present in the mind of the fluent speakers who penned texts in Mahican, Hendrick Aupaumut and Jonathan Edwards, Jr. These writers had minds, ears and speech perfectly attuned to the phonology of the language, making them unlikely to have introduced perceptual distortions or misinterpretations into their manuscripts. Printed typographs in these texts have been identified, some of which are discussed in Goddard 2008.[9] The cognitive illusion here can be found in the form of a bias termed the *curse of knowledge*. The writers were relatively unaware of how their manner of writing the language might be perceived by persons less familiar with the sounds, structure and sociolinguistic aspects of Mahican.

Hendrick Aupaumut saw no need to distinguish nasalized vowels from other vowels, since his readers, composed of fluent speakers, would be expected to know how to pronounce the words properly.

Another fluent speaker, Jonathan Edwards, Jr., made a strong effort to anticipate the needs of his readers and provided some explanatory guidance about the writing system he used, clarifying the correct pronunciation of the words he provided.[16] These explanations, although critically important, do not resolve all uncertainties.

Fluent speaker Dennis Turkey narrated a story shortly before his death that was transcribed by a Dakota Indian, J.F. Estes, using the Dakota-language writing system. The story was published by the Algonquianist J. Dyneley Prince in 1905. Estes told Prince that there were "failings" in the transcription because Mr. Turkey was "old and toothless and consequently most difficult to follow."[24] It is very helpful that Prince added this comment to his paper because it serves the dual purpose of providing a disclaimer for the accuracy of the transcription while alerting the readers to use caution when extracting data from the text.

Similar disclaimers were provided or implied by the highly esteemed Algonquianists Truman Michelson, Morris Swadesh, Dr. Frank T. Siebert, Jr., and John P. Harrington in the unpublished field notes of the Mahican words, phrases and stories they transcribed between the years 1914-1949. All of them worked with less than fully fluent speakers. Transcription symbols varied from one researcher to another, and it can be assumed that each linguist possessed better or worse sound-detection skills one to another. Goddard noted that the linguists in this time period

differed in their ability to accurately perceive certain sounds such as nasalized vowels and sibilants.[9] Aspiration especially was also variably recorded among the transcribers presumably because of differences in their individual aptitudes to hear them or because of the consultants' variable propensity to audibly produce these sounds.

As expected from working with Mahican semispeakers, consonants and vowels were not consistent between consultants for any given Mahican word. Moreover, all consultants varied to some degree from one interview to the next in their manner of pronouncing the words. Variability is habitual in everyday speech patterns, but the degree of variation noted raises questions about the phonological quality of the data as it pertains to the declining language proficiency of the consultants. A theory of sound change based on data with this degree of ambiguity would be difficult to prove scientifically. Ives Goddard handled this difficulty by citing the form deemed to be "most historically accurate" when referencing words with divergent phonology found within the 20th-century source materials.[9]

In medical science research, it is increasingly common for authors of medical textbooks, professors in medical school programs, attending physicians in residency and fellowship programs, and published clinical guidelines to rank information in terms of its quality of evidence and its strength of recommendation. This system allows clinical providers to easily identify high-quality evidence-based conclusions from studies whose findings have been confirmed by multiple research groups. Less strong evidence deemed likely to be confirmed in follow-up studies is distinguished from tentative findings, which are to be interpreted with caution. False or misleading study results, which should be rejected, are ranked at the bottom of the list.

It may be useful to consider developing a "quality of evidence" tool for use in linguistics. Data used to reconstruct a language using evidence of poor quality could be avoided.

Goddard can be counted on to include comments about the strength of the assertions he makes in his articles. Examples from his Mahican paper include phrases such as "an unlikely confusion supported by no evidence" and "much philological analysis remains to be done." Strength of evidence is also indicated by the use of "may …," "possibility of …," "which could also …," and "assuming that.…"[9]

The inclusion of these indicators reflects scholarly integrity and Goddard's propensity for collaboration, since these statements reflect his willingness to share unconfirmed insights and hunches with the readers, even though some may be speculative. The willingness of a highly trained professional such as a linguist emeritus, an academic professor of medicine, or a country doctor to say, "I'm not sure. Let me look that up," or "I don't know," is in my opinion a very positive attribute. Doctors who are unwilling or unable to admit incertitude are dangerous doctors as far as I am concerned.

The Mahican language project of 2017 could have benefited from a more precise assessment of the linguistic evidence and a willingness to seek out expert guidance in the face of much uncertainty in the 20th-century data. The use of a rating scale to rank the quality of linguistic evidence would be very useful when reviving an endangered or slumbering indigenous language. Community members would be better prepared to embrace later changes or revisions if fully informed at the onset of the project that there were unresolved issues concerning the quality and variability within the data used to reconstruct their language. An indigenous language should not be revived using low-quality data, when higher-quality sources are available. Unfortunately, the 2017 Mahican reconstruction project was built on a foundation of low-quality data, but the community was not properly informed of it.

Examples of Sound-Perception-Detection Issues and Illusions in Mahican.

(4) Four linguists; *same consultant*; variable sibilant perception
(4a) 'potatoes' per consultant Bernice Robinson (animate plural form, loan word)
      i) [pa̲tátosa̲kʻ] /s/ (Truman Michelson, 1914)[25]
      ii) [pətá:tθak] /θ/ (Frank T. Siebert, 1930s)[26]
      iii) [pətatθɑk] /θ/ (Morris Swadesh, 1938)[28]
      iv) [pəta:tsʌk] /s/ (John P. Harrington, 1949)[29]
(4b) 'potato' (singular form); *other consultants*
      i) [ptãtus] /s/ (Truman Michelson, 1914; Sot Quinney consultant)[25]
      ii) [pəta:tɑθ] /θ/ (Morris Swadesh, 1938; Julia Palmer consultant)[28]
      iii) [potá:tus] /s/ (Morris Swadesh, 1938; consultant e8.5 unknown)[28]

Although this word is an English loan word, it is worth examining to glean insights into the phonology of Mahican, with particular interest in the way an English word might influence the ways Mohican persons might pronounce it. We know that the sibilant in this word is a bona fide Mahican language final and not a remnant of the English plural suffix since the word is attested in its singular form with the ending /əs/ or /əθ/ (examples 4b).

Siebert and Harrington transcribed a protracted second-syllable vowel (matching the English vowel duration), whereas Michelson and Swadesh heard it shorter. Since the consultant was the same person, it is probable that she pronounced the word similarly to all four linguists, but then again, people do vary from instance to instance in how they say words. When the data are ambiguous, it is hazardous to interpret it according to one's personal opinion especially if working alone and unsupervised. Uncertain data should be flagged as such, and one's best guess, as clever as it might seem, should not be represented as a definitive conclusion.

There is some evidence pointing to variability in sound-detection skills among the four 20th-century linguists who worked with Wisconsin Mahican semispeakers. All four linguists are known to have transcribed words uttered by Stockbridge Mohican consultants using two of the three sibilant sounds known to occur in Mahican, /s/ and /θ/. The third sound, /ʃ/, was heard and transcribed by Swadesh, Siebert and Harrington. I could not find any words in Michelson's transcriptions using this sound. Its absence in Michelson could be explained by a gap in his sound-detection capabilities, a cognitive bias contributing to a misperception of sibilant sounds,

the possibility that no consultant used that sound in Michelson's presence, or a misperception of /ʃ/ on the part of the other 20th-century linguists. It would most certainly be an error to summarily dismiss the existence of the Mahican /ʃ/ based on the Michelson data since later linguists attested many words matching historical forms. It should not be assumed, however, that all of the sibilants heard by the various linguists were all transcribed with perfect accuracy. In science, in everyday life, and in linguistics, we must learn to embrace uncertainty.

In Goddard 2008 it was mentioned that Mahican was showing signs of shifting away from a historical distinction between sibilants. This paper does not cite any forms from Harrington nor does it list Harrington's field notes as a source. The Harrington data, however, confirm what Goddard stated and provide some evidence that the shift never became generalized. More than thirty words containing /ʃ/ (also sometimes written as /š/) appear in the Harrington database. An example is provided below, with a listing of other attested versions of the same word showing a continuous variability in the pronunciation between consultants across all time periods from the 18th through the 20th century.

(5) Overview of sibilant variants for the verb "to be windy" in Mahican source materials
(5a) [gêtshachen] /ʃ/ 'der wind' (Büttner, German-Moravian orthography, 18th century)[14]
(5b) [gãschchúk] /ʃ/ (Heckewelder, German orthography, 18th century) (conjunct form)[15]
(5c) [ksukhon] /s/ (Hendrick Aupaumut, 1795, John 3.8)[17]
(5d) [chahun] /tʃ/ (Thomas Jefferson, early 19th century)[21]
(5e) [ksaughhon] /s/ (Jenks/Konkapot, early 19th century)[20]
(5f) [sáx̱an] /s/ (Truman Michelson, 1914, Sterling Peters consultant)[25]
(5g) [ksaxán] /s/ (Morris Swadesh, 1937-38; consultant e3.12)[28]
(5h) [ʃʌkʌn] /ʃ/ (John P. Harrington, 1949; Bernice Robinson consultant)[29]

(6) Differences in the detection of word-final aspiration among 20th-century linguists
(6a) The Mahican numeral 'three' according to consultant Bernice Robinson
        i) [náxa] no final aspiration (Truman Michelson, 1914)[25]
        ii) [náx:a] doubling but no final aspiration (Morris Swadesh, 1937-38)[28]
        iii) [náxə'] aspiration heard and transcribed using ['] (Frank T. Siebert, 1930s)[26]
(6b) The AI imperative 'come in, enter' both examples provided by consultant Webb Miller.
        i) [dəmi:káx] final aspiration heard and transcribed using /x/ (Morris Swadesh, 1937-38)[28]
        ii) [damíkà] no final aspiration (John P. Harrington, 1949)[29]

Explanations could be provided to explain why different linguists variably transcribed the word /ndəmi:kah/ provided by the same consultant, Webb Miller, but the hypotheses would all be speculative, and none of them could be proven. Given the ambivalence of the data, my recommendation would be to reconstruct Mahican using the most historically correct versions of words. The choice made by the Mahican reconstruction project contractor was to omit all word-final aspirated sounds.

There are words collected in the 1900s that match the self-transcribed words of the fluent 19th-century speakers confirming the postvocalic aspiration of 19th-century forms and supporting the ongoing use of the suffix /h/ as the proper 2nd person singular imperative ending for AI verbs in Mahican. There are attested 20th-century forms that also confirm /h/ as a word-final suffix with

the effect of shortening a word-ending long vowel, as in (6aiii). The contractor hired in 2017 to reconstruct Mahican instead unilaterally decided to replace /h/ with a glottal stop in these morphosyntactic environments using ambivalent data to rationalize it.

(7) Matching AI imperative endings despite a 150+ year time gap
(7a) [pó:təwa'] 'make a fire' /pó:tǫwah/ (Frank T. Siebert, 1930s, Bernice Robinson consultant)[26]
(7b) [pootouwah] 'make a fire' /po:tawah/ (Jonathan Edwards, Jr., 1788, self- consultant)[16]

The linguists' field notes also demonstrate variability in vowel-quality perception. The decision to "regularize" all /i/ sounds with /e/ cannot be supported by the source-material data. The variability in this vowel could be adequately explained by linguist-skill differences or by consultant-pronunciation deficits. This vowel is examined in greater detail in a subsequent section of this paper.

(8) Vowel-perception differences among 20th-century linguists
(8a) /e:/ vs. /i:/ vs. /ɪ:/ by the same consultant
      i) [dɑme:kɑ] 'come in, enter' (Morris Swadesh, 1937-38; Bernice Robinson consultant)[28]
        ii) [dʌmi:ka] 'come in, enter' (John P. Harrington, 1949; Bernice Robinson consultant)[29]
      iii) [dʌmɪ:ka] 'come in, enter' (John P. Harrington, 1949; Bernice Robinson consultant)[29]
(8b) /e:/ vs. /i:/ by the same consultant
      i) [na:ne:we] 'nine' (Morris Swadesh, 1937-38; Webb Miller consultant)[28]
      ii) [ná:nì:wɪ] 'nine' (John P. Harrington, 1949; Webb Miller consultant)[29]

From these examples, it would appear that Swadesh was more likely to hear /e/ where Harrington heard /i/. Fluent speakers *never* used /e/ in any of the Mahican words they wrote down, strongly supporting the conclusion that /i:/ represents the correct rendering. Ives Goddard was asked for an opinion, and he assured me by personal e-mail that the Mahican /i:/ was a "lower high" vowel and not any kind of /e/.

Trustworthiness of the Data Collection

Flawed data may be introduced in scientific research during the process of data collection. Knowledge of how data are collected is important to the interpretation of study findings but is largely unknown for indigenous language words collected before the modern era.

Languages spoken by large numbers of people should optimally use a randomized method of gathering data samples. Nonrandom data collection can skew the results of a study because the data analyzed are not truly representative of the population being studied. For example, testing the average visual acuity of first graders by selecting subjects from the front row of the classroom is likely to underestimate the average visual acuity of the students, since kids with poor eyesight may be more likely to sit in front, closer to the blackboard.

Language studies may not always be able to use a random selection process, such as those cases when only a small number of semispeakers and rusty rememberers are available. Without a larger reference population for comparison purposes, there is no way to know for sure whether the data

supplied by the consultants can be trusted to be representative of the language being studied. Depending on how much of the language has been documented previously, it may be difficult to categorize words produced by a small number of consultants speaking a language that is no longer in use as the primary means of communication in the community. All forms examined warrant an approach using the format of a "differential diagnosis" to describe possible explanations for areas of divergence from previously attested words. A partial list of differential diagnoses might include language change, familiar (informal) versions of words, personal neologisms, or unattested variants.

A different list of differential diagnoses might apply to words collected from a very small number of individuals speaking a language in which they never acquired fluid speech proficiency. Morphological and phonological deviations might be explained in several ways: partial recall of words, poor enunciation, and contamination of words with phonemes from other languages (English, languages from neighboring communities).

Concerning the last possibility, it should be noted that when indigenous communities were compelled to relocate away from historical homelands onto reservations, intertribal marriages became more common resulting in situations where the grandparents of semispeaker consultants spoke more than one indigenous language.

In medicine, a diagnosis is established after ruling out alternative possibilities or ruling in the suspected condition using solid evidence. Robust unambiguous evidence is especially important when the treatment required for that diagnosis entails dangerous risks or debilitating adverse reactions. Likewise, for a language-reconstruction project, phonological and morphological misdiagnoses may result in risks to the community. Therefore, deviations in words and inflections should not be heralded as arising from the normal processes of language change unless there is clear and convincing data to support that hypothesis. The language contractor for the Mahican project made that assumption without adequate evidence and reconstructed the language using deviant forms and phonemes.

Semispeakers and rememberers may be *rusty enunciators* in addition to having patchy recall of words, affixes, and phonemes. At age nineteen, I lived and studied in France. After a few years I became a rusty enunciator of English. It was difficult to properly enunciate English words during visits home. My mouth and tongue were uncooperative. Improvements occurred quickly, though there was a lingering sense of awkwardness. Habitual speakers of one language may not be able to reproduce the sounds of another language accurately, especially during their initial attempts. It is noteworthy that words elicited from Mahican semispeakers and rusty rememberers were subsequently corrected by the consultants in follow-up interviews, perhaps as a result of better enunciation.

It is troubling to note that the hired Mahican language revitalization contractor took it upon himself to recast the phonology of Mahican using phonemes of unverifiable quality that were inconsistently produced by the consultants. His only explanation provided was that "all

languages change." The possibility that one or more cognitive biases influenced this interpretation of the data must be considered. Conjecture should not form the basis for key language-reconstruction decisions. A second opinion from an experienced linguist should have been obtained, and although the Mahican-language contractor was prompted to contact Ives Goddard, he declined to do so.

The 20th-century Mahican data leave us with a plethora of hypotheses, all of which are impossible to verify or to reject with any degree of confidence because of the small size of the datasets, yet one partially trained contractor imposed a speculative interpretation on an entire community. Admittedly, this article represents a case report with an "*n*" of one, making it unwise to cast a shadow on the greater cohort of people working in the field of linguistics, most of whom are intellectually honest, reasonably self-aware of their personal biases, and striving to conduct themselves in alignment with professionally ethical guidelines. The failures noted have the potential to teach important lessons for scientists of all disciplines. It happened to the people of my tribe, and so it may happen again elsewhere.

In a frequently cited essay titled, *Why most published research findings are false,* John Ioannadis, a professor of Medicine and Statistics at Stanford University, explored the reasons behind his provocative assertion that most research is flawed. Studies that deviate from their original endpoints (study-design flexibility) may produce untrustworthy results. The researchers' financial relationships and the presence of researcher bias are known to produce a strong influence on the findings of a study.

Especially relevant to the current discussion, Ioannadis reported that studies with low sample sizes were less likely to produce true findings regardless of what branch of science was involved.[57] He also demonstrated that small-effect sizes in a study will reduce the probability of obtaining true findings. For example, it is easier to obtain accurate accident rate reports for a widespread activity such as commuting by automobile versus a less common means of transportation such as travel by camel, pogo-stick, or hot air balloon. The small number of reported motor vehicle accidents involving Deloreans does not necessarily indicate that it is an automobile safer than other makes and models. It may simply represent a statistical anomaly attributable to the fact that few people drive Deloreans on the road. In medicine, common diseases are easier to study than rare disorders. In linguistics, there is an equally powerful relationship between the sample size and effect size and the reliability of the results. Lucy Thomason based her linguistics Ph.D. dissertation on 150,000 lines of Meskwaki text.[47] In comparison, the sum total of all of the Mahican source materials from all time periods numbers at most a few thousand lines of text.

Before moving on to a discussion of cognitive biases and illustrative Mahican language examples, another type of data-collection flaw deserves to be highlighted, using a medical example.

Every medical student is trained in the art of taking a medical history. Even in the modern era with the availability of advanced technological diagnostic resources, many diseases can be diagnosed only after a good history is taken. Seizure disorders are diagnosed by history and not by test results since 10% or so of the normal population have abnormal electroencephalograms (EEGs). Many patients with epilepsy have normal EEGs when not experiencing seizure activity. Thus, the EEG lacks sufficient specificity to certify the diagnosis, with the exception of absence seizures, which have a *pathognomonic* 3Hz spike on the EEG. Very few conditions in medicine have a so-called pathognomonic sign that can be counted on to indicate a specific diagnosis, which is why this information is so easily remembered by medical students. Many other common diseases can be diagnosed only after a good medical history is taken, as with lupus erythematosus and attention deficit and hyperactivity disorder (ADHD). Said another way, there is no way to perform a test for these disorders that would categorically rule in the diagnosis. A person's attention span can be tested, but there are many possible causes for inattentiveness such as anxiety, depression, trauma, sleep apnea, intercurrent illnesses, or life stressors. Anti-DNA antibody tests are useful when a diagnosis of lupus is suspected, but the true pathway to confirming its presence is medical detective work, collecting signs and symptoms from the patient and ruling out disorders producing overlapping symptoms and similar blood test results.

Doctors are trained to gather a medical history in ways that avoid "leading the witness" while secondarily using close-ended questions to minimize the possibility of omissions. This is one reason why relationship skills, known as the bedside manner, are critical to both physician perceived and measured effectiveness. A medical student may consistently obtain top academic honors and score high on tests or board exams but may become a mediocre doctor for lack of the interpersonal abilities needed to collect medical data accurately.

Linguists eliciting words and phrases from people need a set of relationship-building and communication skills similar to the ones health care professionals use. In 1788, Jonathan Edwards, Jr., spoke of the difficulties in obtaining accurate word forms from indigenous consultants, drawing attention to various ways words can be elicited from a monolingual American Indian speaker. He offered examples of how an consultant would add prefixes and suffixes to dependent nouns and verbs, resulting in a word with a slightly different meaning from that anticipated.

Several examples of this phenomenon can be found in the words collected by two of the 20th-century linguists, Swadesh and Harrington. It is uncertain whether the mismatch between the English gloss and the inflectional form supplied by an consultant was an elicitation error or an artifact of the note-taking process used by the linguist. It is possible that glosses were recorded as understood by the consultant, and it could be that the linguist simply omitted to specify a possessive form. Evidence pointing to notes written in haste can be found. On a slip card written by Swadesh pertaining to garments, he wrote the gloss "close" instead of "clothes." This error also is suggestive that Swadesh was writing down the glosses specified by the consultants themselves. Many Swadesh slips record Mahican words without any gloss, typically when grouped with similar meaning words supplied by other consultants or by the same consultant

during previous interviews. One of the 20th-century linguists also recorded a Mahican word glossed as "flower," but another linguist glossed that same word as "flour."

(9) Examples of incorrect glosses of Mh words in the Swadesh field notes[28]
(9a) [pi:tką:so:n] 'garment' (title of the slip)
(9b) [pitkoθon] 'close' (error for 'clothes')
(9c) [kto:n] 'mouth' (error for 'your mouth')

(10) Examples of ungrammatical Mh words in Swadesh[28]
(10a) [nda:yo:m] 'our son' (error for 'my son'; 1p suffix is needed for it to mean 'our son')
(10b) [wəda:yo:m] 'his son' (error for |wəda:yo:man|; missing obviative suffix)
(10c) [nyakmə gų:t] 'his foot' (error for |wəką:t|; missing 3s prefix; properly means 'leg')
(10d) [nyana wikít] 'our house' (error for |wi:kiya:k|; incorrect use of 3s conjunct ending instead of the 1p ending)

(11) Examples from Harrington of ungrammatical Mh words or mismatched glosses[29]
(11a) [n-tʃǔ:θan] 'his friend' (mismatched 1s prefix on a form with an obviative suffix)*
(11b) [mʌksʌnʌ̀k] 'shoes' (animate suffix on a normally inanimate word)
(11c) [mʌkxú:sʌsʌn] 'owls' (wrong gender ending, or missing plural obviative suffix)
(11d) [pa:tậso:wak] 'ye are tall' (wrong gloss for this 3rd person pl. form)

*Note: it is possible to have an obviative 1st person possessed form in Eastern-Algonquian languages depending on the context in a discourse.

Anytime one interacts with an object or a person to collect data, changes may occur. It is very difficult, if not impossible, to precisely measure a rubber band. Heraclitus said it well *circa* 500 B.C., "No man ever steps in the same river twice, for it's not the same river and he's not the same man." Rivers have special meaning for tribal members of the Stockbridge-Munsee Band of Mohican Indians, since our tribal name according to oral and written versions of our history, is the word "Muhhekaneew,"[16, 18, 30] or /mąhi:kani:w/ phonetically, which signifies 'a person of the waters that are never still'. Macroscopically, rivers ebb and flow and even apparently change colors depending on the ambient light conditions. Microscopic and ultrastructural changes in temperature, chemical composition, clarity, density, and other parameters occur constantly. The same is true for biological systems, including human beings. This is pertinent to the topic of data collection in linguistics and has an effect on the replicability of studies. The social context affects the collection, analysis, and interpretation of linguistic data and influences decisions about how, when, or if to publish the findings.[68]

These intrinsic variabilities affect the replicability of certain types of studies. Almost all scientific disciplines have to contend with data-variability issues. It has been written that scientists across all disciplines will accept a single study without its replication as long as the *p*-value is below 0.05. Even the lowest of *p*-values does not guarantee the accuracy of the study's findings because it simply reflects that the statistical analysis of the data is not likely to be attributable to random variabilities. It could just represent bad data wonderfully analyzed. It is also a myth to believe that all medical studies are beautifully replicated.[57] Flaws in study design,

methodology, improper statistical analysis, and cognitive biases can explain failure to replicate findings across the full spectrum of scientific disciplines.

In the 20th-century Mahican sources, the phonological and morphological data are quite uneven. Words written with glottal stop symbols can be found adjacent to the same word transcribed with /h/ or its equivalent, /'/. Nasalized /ą/ or /ã/ was transcribed using a wide range of symbols. Not all cases of nasal vowels can be traced back to published Proto-Algonquian forms to confirm their validity. Words historically known to use /i:/ were sometimes written with /e:/ and in one case both variants occurred for a word uttered twice in the same sentence of a story transcribed by Michelson. Other vowels show similar variability, /a, ə, ɪ, o, u, ʊ/. There are insufficient data to establish a reliable bell-curve distribution of the variants found. Common sense and professional judgment must guide the interpretation of the ambivalence of the data.

For confirmation of the hypothesis that a language has generalized sound changes as a process of natural patterns of speech evolution, a certain number of conditions must be met. An adequate pre-test probability of verifying the hypothesis would need to be present, but since the pool of speakers totaled less than fifteen individuals, the odds of proving the theory would be extremely low. In a scenario of naturally occurring language change, the probability of hearing obsolete words and sounds should gradually diminish over time. Common sense would dictate that changes in a language that were first noted when the language is no longer in use within the community and when all of the consultants are semispeakers are not likely to be attributable to natural language change. An approach grounded in scientific integrity would have involved meaningful collaboration with all available community members and guidance from the very best minds in Eastern-Algonquian linguistics rather than championing a personal theory that cannot be proved.

Changes in the Mohican tribal name based on a set of controversial phonological changes have caused concern and division within the community.

(12) Mohican tribal name
(12a) /mʌʔe:kʌnew/ (as phonetically revised by the 2017 Mh language program contractor)
(12b) /mạhi:kani:w/ (traditional pronunciation)
        i) [Muhhekaneew] (Edwards, 1788)[16]
        ii) [Muh-he-ka-nuk] (Rev. John Sergeant, 1818) (locative form)
        iii) [Muh-he-ka-neew] (Hendrick Aupaumut, before 1825)[18]
        iv) [Muh-he-con-new] (John Quinney, 1854)[61]
        v) [Muh-hea-ken-neew] (Electa Jones, 1854)[18]
        vi) [Muh-he-ka-ne-ok] (John Davidson, 1893)[30] (plural version)

Prior to the 20th century, no glottal stop was present in the Mohican tribal name. The aspiration in the word Muhhekaneew /mạhi:kani:w/ was prominent as evidenced by the geminate "hh" in the vast majority of renderings of the name. Postvocalic /h/ was *apparently* replaced by /ʔ/ in many words documented by linguists in the period 1903-1914. Swadesh, in the 1930s, transcribed many words with /h/ or /x/ alongside similar words with /ʔ/. Siebert used no glottal stops in the thirty or so words he transcribed in the 1930s, which can be found within the

Swadesh field notes. Siebert marked aspiration using the single open quotation mark /'/in several words matching historically attested Mahican words. Harrington recorded scores of words with /h/ or /x/ matching historical versions. The distribution pattern of this substitution does not clearly support a sound change.

An explanation will now be provided for the use of the word *apparently* used in the preceding paragraph. First of all, in 1903, aspiration was not written by the transcriber (Estes), and the consultant (Dennis Turkey) was elderly and toothless. In 1949, Harrington read a portion of this 1903 text to his consultant Webb Miller, who corrected the pronunciation of the vowel in the word "river" and corrected the glottal stop to a robust aspirated sound. See (13b).

(13) 1903 Aspiration data
(13a) [thépo Maik:anet:úk] 'river of the Mohicans' (Dennis Turkey in Prince, 1903)[24]
(13b) [θí:pʊ mʊxí:kʌnʌk] (Webb Miller in Harrington, 1949 after hearing the Prince text)[29]

Notice that Mr. Miller did not use the optional noun final /ihtukw/ 'pertaining to a river' that was used in the form supplied by Mr. Turkey. Instead, he used the locative suffix /ək/, correcting the absence of a locative suffix on Turkey's form. The locative form of this word using the final /ihtukw/ would be /mąhi:kanihtkook/ 'at the Mohican river'.

Secondly, in the 1914 data, aspiration in Mahican words appears to be mostly absent. Occasionally Michelson transcribed words using an open single quotation mark /'/, /h/, or /x/. Historically attested aspiration in some words was not marked at all, including a common class of verbs using the final /ahaa-/ 'make, gather', which can be productively added to a noun stem. Almost all postvocalic and word-final instances of /h/ were written by Michelson using a superscript epsilon, /ᵉ/. and this symbol was clearly identified as a glottal stop in another paper he authored.[62]

A review of Michelson's field notes for the Munsee dialect of Delaware show that this superscript epsilon was used for Munsee words known to be aspirated according to historic and modern transcriptions. Audio recordings of Munsee also prove the use of aspiration in places where Michelson wrote a superscript epsilon.[66] This comparison provides critically important insight into the interpretation of this symbol in Michelson's Mahican transcriptions.

(14) Mohican tribal name in the Michelson *Mahican* field notes[25]
(14a) [Móᵉikʌnēu] (Sot Quinney)
(14b) [Maᵉēkanēu] (William Dick)
(14c) [Mäᵉēkänēu] (William Dick)
(14d) [Maiyēkañēyäkᶜ] (William Dick)
(14e) [Maᵉēkänēäkᶜ] (William Dick)
(14e) [Mʌhiganīu] (Edwin Miller)

(15) Comparative *Munsee* transcriptions by Michelson[63]
(15a) 'horse'
        i) [näᵉnayañgeθ] (Michelson Ontario 1922)[63]

        ii) [nehnayoongus] (O'Meara dictionary 1996)[64]
(15b) 'tree'
        i) [míᵋtukw] (Michelson Ontario 1922)[63]
        ii) [mihtukw] (O'Meara dictionary 1996)[64]
        iii) [mihtəkw] (Goddard)[56]
(15c) 'bird'
        i) [aweᵋlēcos] (Michelson Ontario 1922)[63]
        ii) [awehleeshoosh] (O'Meara dictionary 1996)[64]
(15d) 'tobacco'
        i) [kwa̠caᵋtä] (Michelson Ontario 1922)[63]
        ii) [kwshahteew] (O'Meara dictionary 1996)[64]

The Munsee data at the very least raise questions about the validity of a Mahican glottal stop. If Michelson did not distinguish aspirated stops from glottal stops among Munsee speakers, then it is reasonable to believe that Mahican aspirated sounds were not detected reliably. The higher percentage of forms transcribed with postvocalic aspiration in fieldwork done many years after Michelson's visit clearly demonstrates that glottal stops had not become generalized in 20th-century Mahican.

Let us suppose momentarily that during the later part of the 19th century Mahican had undergone a naturally progressing shift from the use of postvocalic /h/ to postvocalic /ʔ/. In 1914, this hypothetical change was so far advanced that almost no words with a clearly transcribed aspiration can be found in the Michelson field notes. The breathy aspiration so characteristic of historical Mahican had vanished. The Stockbridge-Munsee Community had not yet settled into its present-day reservation near Bowler, Wisconsin, because tribal community members resided in a few scattered Wisconsin townships. The tribe was still recovering from a devastating political division triggered by interference from the U.S. government starting in the 1840s when American citizenship was offered in exchange for relinquishing tribal membership, and a large portion of tribe accepted the deal.[8] They were not reinstated until the 1880s, but the damage to the community could not be undone. Only a few people continued to speak Mahican words and phrases such that only several hundred words were learned by the younger generations, the grandparents of the present-day elders of the tribe. If glottal stops had indeed become the norm by the year 1914, one would expect that linguists visiting the tribe after that date would hear nothing but glottal stops when eliciting words from Mohican consultants. Postvocalic aspiration would have gone extinct in the Stockbridge language. The situation would be similar to the extinction of a species. First it becomes endangered, and sightings are scarce. Population estimates dwindle, eventually reaching zero. The species is then declared extinct by scientists, just as extinct as the Mahican language program's hired contractor declared the use of aspiration.

In 1938, a fisherman caught an odd looking fish that was recognized as a coelacanth [siːləkænθ] by a South African museum curator. The coelacanth had been thought to be extinct for 65 million years, and once experts confirmed its identity, the theory of its extinction was immediately debunked. No scientist explained the find by postulating that natural processes of evolution had repopulated the oceans with a fish identical to its prehistoric version. The linguists Swadesh and

Harrington caught such a "find" when they documented word after word with clearly articulated postvocalic aspiration. One of the consultants, Bernice Metoxen Robinson, had been a source of Mahican words for all four 20th-century linguists, Michelson, Swadesh, Siebert, and Harrington. In 1949, Harrington documented her *insistence* that the tribal name be pronounced with an aspiration in its second syllable. Harrington's other primary consultant, Webb Miller, did exactly the same, correcting the phonological omission of the aspiration in the tribal name of Dennis Turkey's narrative, as originally transcribed by Estes, a Dakota Indian. See examples (15a) and (15b). It is difficult to explain this if the use of glottal stops had become generalized some thirty years earlier.

Based on the linguistic evidence, the theory of diachronic change as a by-product of the natural evolution of a living language is at best tenuous.

(16) Extinct "fish" caught by John P. Harrington in 1949[29] See also (15a,15b)
(16a) [Moxí:kʌnʌk] (Bernice Robinson, reel 12, image 557)
(16b) [Ma:xi:kʌnɪwʌk] (Bernice Robinson, reel 12, image 559)
(16c) [Mohíkʌnʌk] (Webb Miller, reel 10, image 798)
(16d) [Mʊxí:kʌnʌk] (Webb Miller, reel 10, image 804)

One of Harrington's methods was to share Abenaki and Menominee words with his consultants hoping to elicit comments and Mahican cognates. There is also evidence in the field notes that Harrington showed his consultants excerpts of Mahican words and texts from the Estes and Michelson transcriptions. Webb Miller corrected the forms of Estes (15a,b), and corrected Michelson's forms using aspiration where Michelson had written superscript epsilons. This is hardly the pattern one would expect to encounter if the Mohican community of semispeakers had become accustomed to using glottal stops instead of aspirated /h/ sounds. It is also interesting to note that both 1949 consultants used the more prominent voiceless fricative /x/ when correcting Michelson's forms. I could be over-interpreting this, but my thought is that both of his main consultants wanted to be especially sure that Harrington clearly heard the aspiration.

Swadesh transcribed many words containing /h/ or /x/ to indicate aspiration and did so in words that Michelson documented using /ø/ or /ᵉ/. This pattern is also exactly the opposite of what would be expected for a sound change that was theorized to have become generalized 25 years earlier. In 1949, Harrington used markings for aspiration in about half the words expected to be aspirated based on historical sources, an even higher percentage than what was found in the Swadesh field notes.

(17) Comparative phonology 1903-1949
(17a) Michelson /ø/ vs. Swadesh /x/
   i) [ndamika] 'come inside' (Michelson 1914, Folder 1,22a; Sot Quinney)[25]
   ii) [dəmi:kax] 'come inside' (Swadesh 1937-38, Webb Miller)[28]
(17b) Differential placement of /ᵉ/ vs. /ʔ/
   i) [tcētᵉsäsäkᶜ] 'birds' (Michelson 1914, Folder 4,2-4; William Dick)[25]
   ii) [cɪʔtθαθ-αk] 'birds' (Swadesh 1937-38, Julia Palmer)[28]
(17c) Michelson /ᵉ/ vs. Swadesh /h/
   i) [nāwéᵉ] 'come (sg)' (Michelson 1914, Folder 1,6a; Sterling Peters)[25]

ii) [na:wɛ'] 'come (sg)' (Swadesh 1937-38, Avery Miller)[28]

iii) [na:we´h] (Swadesh 1937-38, Webb Miller)[28]

(17d) Michelson /ɛ/ vs. Siebert /'/ (same consultant)

i) [nisá ᵋ] 'two' (Michelson 1914, Folder 1,5b; Bernice Robinson)[25]

ii) [ni:sa'] 'two' (Siebert in Swadesh, Bernice Robinson)[28]

(17e) Interchangeability of /h/, /'/, and /x/

i) [ōθ'] 'kettle' (Michelson 1914, Folder 1,7b; Sterling Peters)[25]

ii) [ho:s] 'kettle' (Swadesh 1937-38, e2.14)[28]

iii) [xʊ:θ] 'kettle' (Harrington 1949, Webb Miller)[29]

(17f) Michelson /ɛ/ vs. /ʔ/, /h/, or /x/

i) [t̯amá ᵋēkan] 'ax' (Michelson 1914, Folder 1,11c; Alfred Miller)[25]

ii) [tma:ʔi:kɑn] 'ax' (Swadesh 1937-38, Avery Miller)[28]

iii) [təma:ʔi:kɑn] 'ax' (Swadesh 1937-38, Julia Palmer)[28]

iv) [ktɑmhi:kɑn] 'your ax' (Swadesh 1937-38, Julia Palmer)[28]

v) [tʌm-hi:-kʌn] 'axe, 3 syllables' (Harrington 1949, Reel 10, image 361; Webb Miller)[29]

vi) [tʊ́mhi:kan] 'ax' (Harrington 1949, Reel 10, image 362; Sam Miller)[29]

vii) [tʊ́mxì:kʌn] 'ax' (Harrington 1949, Reel 10, image 362; Webb Miller)[29]

(17g) Sam Miller in Swadesh (aspirated) vs. Dennis Turkey in Prince (no aspiration)

i) [pi:ht ka:t] 'well perhaps' (Swadesh 1937-38, Sam Miller)[28]

ii) [p·iit·in] 'perhaps soon' (Estes in Prince 1905, II-6; Dennis Turkey)24*

(17h) Example of 19th-century Mahican vs. 20th-century Swadesh vocabulary

i) [nhaun] 'main, principal' (*Assembly's Catechism*, A1; Hendrick Aupaumut 1795)[17]

ii) [nxɑn] 'main, principal' (Swadesh 1937-38, Sam Miller)[28]

*Reproduced here as published. Cited form was not written as [pi:t i:n].

The examples above represent only a fraction of what could have been provided. To be clear, many forms in the Swadesh field notes were written with glottal stops. In some instances, however, aspiration was marked alongside other entries with stops. Many forms in the Swadesh field notes were written with word-initial glottal stops. Most or all English vowel-initial words begin with glottal stops, a fact that escapes the awareness of many native speakers. In French, glottal stops may be optionally inserted word-initially for emphasis creating a clear boundary between the last syllable of the preceding word and the first syllable of the following word. Mahican syllables tend to join together, and Swadesh was apparently writing word-initial glottal stops to indicate the proper spacing of syllables across multiple word boundaries.

In conclusion to this topic, it is possible to assert that proper data interpretation must take into account the manner by which the data were collected, idiosyncrasies rooted in the personal and professional capabilities of the data collectors, the amount of time spent acclimatizing to the phonology of the language before attempting to finalize documented word forms, and the influence of previous linguists' conclusions or opinions about the language being studied. There is ample reason to doubt the hypothesis that Mahican had evolved into a new modern 20th-century dialect based on the paucity of quality data and trends in the data that fail to show the expected spread and generalization of the alleged sound changes. Concerns about the reasonableness of the conclusions reached by the person hired to reconstruct Mahican in 2017

are troublesome, particularly attributable to the phonological reworking of the tribal name of the Stockbridge-Munsee Community. Ethical concerns about the contractor's failure to obtain expert guidance from known authorities in Eastern-Algonquian languages have been discussed. Furthermore, the code of conduct for a linguist working the field was substandard with regard to community collaboration and teamwork to resolve matters of contention or uncertainty. In the following section the influence of cognitive biases is explored as a possible explanation for the scientific and ethical shortcomings of the 2017 Mahican reconstruction effort.

Biases affecting the Data-Production Process

When a doctor examines a patient, data being collected aid the diagnosis, which guides the treatment recommendations. If you are the patient, then you provide the data. According to Matthew Zook, a geographer, "Data are people until proven otherwise."[42] Physicians are well aware of the effect of the white coat on a patient's blood pressure. Physical and personality traits of the doctor play an important role in the healing process by instilling hope, restoring confidence, and providing support to their patients, directly modifying the symptoms and their subjective perception.[69] The article referenced here is the author's favorite paper of all time, having provided the guiding principles needed to reconcile the realm of cold hard facts to the miraculous and beautiful individual and social complexities of people.

Datasets capture a snapshot of people and culture, and putting some thought into that concept may yield valuable insights for its interpretation and usefulness. The list of measurements of Noah's ark in the Bible tells us something about the people who lived in the time period when the text was written, beyond what is specified by the words themselves. An understanding of their technological development in terms of the units used for the measurements, their engineering capabilities, and preferred building materials can be inferred. The various editions of an introductory chemistry textbook such as *Chemistry, Man and Society*[70] provide a fascinating picture of human society in relation to technological advances in the sciences.

Historical linguistic databases contain treasure troves of information about human culture, spirituality, and scientific capabilities embedded within the lexical data. President Thomas Jefferson, whose political views were unfavorable to the indigenous people of North America, collected words in several languages, including Mahican.[21] His word lists, which focus on animals, body parts, the weather, food, simple kinship terms, tell us something about Jefferson as a person. His effort to document words from indigenous consultants reflects his desire to preserve the languages of the original inhabitants of the Americas in parallel to his political agenda to remove tribes to the west of the Mississippi and to turn them into farmers.

(18) Examples of Mahican words collected by Thomas Jefferson[21]
(18a) [tschi-tsis] 'bird' (compare with 9b)
(18b) [akeh], [akiy] 'earth'
(18c) [cushatao] 'smoke, tobacco' /kʷʃataːw/ (compare with 7d)
(18d) [nu-sha], [nischah] 'two' (compare with 9d)

Linguistically, it is notable that Jefferson's Mahican words are consistently spelled out syllable by syllable. Aspiration is clearly marked where expected, and syllables often omitted in informal variants of words are present. One can infer that Jefferson asked his consultant(s) to pronounce words carefully. In certain cases, the spelling system varies, raising the possibility that the consultants themselves participated in the manner of writing down some of the words. The final /h/ of the word for the numeral "two" was still pronounced that way in the 1930s when Frank Siebert heard the aspiration from his consultant Bernice Robinson.

A sizable portion of the Mahican source materials date from the 18th century when German-speaking Moravian missionaries collected words and phrases from the Mohicans living in their community. Translations were handwritten written in a German script no longer in common use. It cannot be automatically assumed that the German language of that era was pronounced exactly the same as Modern German. Prior to the publication of a transcription of the original manuscripts, these documents were difficult to analyze. Carl Masthay spent more than a decade reworking these documents, deciphering the German handwriting, translating 18th-century German glosses of Mahican words to their English equivalents, and indexing the entries. He also provided a biography of the dictionary's main original author, Johann Jacob Schmick. Clearly Masthay saw Mahican words as something more than an interesting linguistic code, since he took great pains to inform his readers of relevant historical and cultural influences to be seen within the scholarly linguistic data. The dictionary contains transcriptions of "Mahican" using Cree and Cherokee syllabics, Mayan and Egyptian hieroglyphics, and Chinese characters. These references to other languages and cultures serve as reminders to approach the linguistic data with a mindfulness of sociocultural awareness.

The way we live, think, and speak today is quite different to how an 18th-century Moravian missionary experienced life. It is possible that the words communicated to Johann Schmick, a devoutly religious man, by his Mahican-speaking consultants were chosen for their lack of vulgarity and relevance to church activities. Words describing traditional tribal cultural rituals or ceremonies may have been omitted. It may be difficult for modern era scholars to set aside unconscious cultural biases that influence the way we see ourselves, others, and the world we live in. These biases may partially obscure our perceptions of the social aspects of this database. Highly educated people may feel more at ease in a highly intellectualized view of data than elucidating the emotional and psychosocial underpinnings contained within a set of words from one particular community in a world we can barely imagine. In this case, Masthay did much of background work needed to understand the finer points of this valuable set of Mahican-language data. His decision to include the background information was nothing short of genius thinking.

Scientifically speaking, any collection of data should be carefully scrutinized to ascertain its manner of collection prior to accepting any conclusions about its relevance and quality.

The *British Medical Journal* published in its December 2018 Christmas issue a study that proved that jumping out of an airplane with or without a parachute does not significantly change death rates or the occurrence of major physically induced injuries.[38] The study was a randomized

controlled double-blinded study. Study participants all jumped from an aircraft at the same altitude and velocity wearing a backpack randomly assigned to each person equipped with either a parachute or fabric folded in the shape of a parachute. Two aircraft were used at two separate airfields, and researchers from two different academic establishments gathered data for the study. Since its publication, no allegations of fraud or bias have tainted the study's data, and no errors in the statistical analysis have been found. The key to interpreting this dataset can be found only by reading the article carefully. The first clue is that none of the parachutes deployed *because of the short duration and altitude of the jumps*. An illustrative photo of a participant jumping out of one of the study's aircraft shows that it was stationary and parked on the ground; that is, its altitude was ground level and velocity was zero. The article was published as a satirical illustration of the dangers of accepting a study's conclusion based on a cursory reading of the abstract and the importance of understanding the conditions underlying collection of the scientific data.

Applying this principle to the Mahican Moravian materials, one must account for the influence of the German-language sounds familiar to the missionaries collecting the data, as well as the limitations of the German orthography to accurately record a completely different sound system of an Eastern Algonquian language. The religious context of the relationships between missionaries and the Mohicans, and the presumed but unproved lack of literacy of the Mahican-language consultants are relevant to the study of this database. Handwriting style variations in the manuscripts indicate that more than one missionary may have contributed to the word list. A careful morphosyntactic examination confirms that Mahican had two dialects, mutually intelligible with characteristic changes in inflection patterns and a few areas of grammatical diversion or phonological variation. Eastern Mahican, for example, retained singular and plural obviative suffixes, whereas Western Mahican used the same suffix for one or more third-person participants in a phrase. See Goddard 2008 for more details.[9]

The German orthography was largely adequate for recording consonants, but vowels were written inconsistently, as Goddard highlighted in his paper. In only some cases were nasalized vowels recorded. Aspiration was inconsistently heard and was noted in some instances using unvoiced velar fricatives (German "ch" as in the name "Bach") where voiceless glottal fricatives (breathy "h" sounds) were expected. The semivowel /w/ was often written as [o] or as [u] by Schmick particularly at the beginning of words. Reduplicated words consistently restored the [w] proving it was there to begin with. Contemporaneous writings by the Rev. John Sergeant, who spoke Mahican well enough to preach sermons in the language, never used [o] or [u] in the place of /w/. Writings by the most competent fluent speaker, Hendrick Aupaumut, used /w/ exclusively. Jonathan Edwards, Jr., also used [w] in most instances, although a few third-person words begin with [u], possibly a typographical error since Edwards defined [u] as his way of writing nasalized /ą/, which would not make sense in this context.

Carl Masthay provided some information that might explain why Schmick wrote [o] or [u] instead of /w/ in Schmick's biography. He was educated in a part of Germany where High

German was spoken, and in that dialect /w/ is pronounced as /v/ or /ʋ/. This may explain why his ear was more attuned to hear [o] or [u] rather than /wə/.

French speakers rarely use [w], but the word *oui* ('yes') approximates its sound. In English the words "won" and "one" are homophones.

(19) Examples of word initial /w/ versus [o] or [u]
(19a) TI-1a x-subject conjunct with and without reduplication (Schmick)[33]
      i) [wawonsettamãk] 'they are obedient' /wawənsītamək/ (with reduplication)
      ii) [óhnsettamããk] 'they are obedient' /wənsītamək/ (without reduplication)
(19b) Root /wən-/ 'good, beautiful' (Schmick forms with and without reduplication)[33]
      i) [wawunit] 'beautiful' /wawənət/ (noun root with reduplication)
      ii) [onessó] 'she/he is beautiful' /wənəsəw/ (AI 3s, not reduplicated)
      iii) [wānĕhk] 'the good one (inan.)' /waanihk/ (II conjunct, not reduplicated)
      iv) [ŭnʌĭwágàn] 'a good thing' /wənaywą:kʌn/ (not reduplicated noun)
(19c) Root /wən-/ 'good, beautiful' (Fluent speaker forms, not reduplicated)
      i) [wnittuh] 'they (inan.) are good' /wənətah/ (Aupaumut, Cat.A9)[17]
      ii) [wnissoo] 'she/he is beautiful' /wənəsəw/ (AI 3s independent indicative) (Edwards)[16]
      iii) [wnoiwaukun] 'a good thing' /wənaywą:kʌn/ (noun) (Aupaumut, Cat.A10)[17]
(19d) Indication of orthographic or phonological variation of the 3s, 3p prefix in Schmick[33]
      i) [otajégan] vs. [wtajegan] 'It is his' /wətayi:kʌn/
      ii) [onáiju] 'he is good' vs. [wáŭnăĭkẽẽk] 'the good ones' (initial change reveals the /w/)
      iii) [ðããk] vs. [woãk, wãk, wak] 'and, also, again' /wą:k/
      iv) [ojããs, ojããsh, ojaash, ojãs] vs. [wiãs, wojás, wojãs, wĕjããs] 'meat' /wəya:s/
      v) [osáme, osame] vs. [wasáme] 'too, too much' /wəsami/
      vi) [uskái] vs. [oskekãn] vs. [waskáikè] (root /wəsk-/) 'new'
(19e) Schmick versus historic and 20th-century word forms.
      i) [oneewe] 'thank you' /wəni:wi/ (Schmick *circa* 1760)[33]
      ii) [wneeweh] 'thank you' /wəni:wih/ (1788; Jonathan Edwards, Jr.)[16]
      iii) [wəni:wɩ] 'thank you' /wəni:wɩ/ (Swadesh 1937-38; Julia Palmer)[28]

The 2017 Mahican reconstruction project regularized all words starting with /wə/ using [o]. All third-person prefixes were changed to [o] even though many words in the 20th-century source materials were attested using /wə/. See examples (22). The reason this happened was because the 1914 words and stories were transcribed by Michelson using [u] instead of /wə/. An examination of Michelson's Munsee-language transcriptions reveals that [u] was used in lieu of /wə/ in the same pattern as was used in the Mahican transcriptions. Munsee speakers pronounce /wə/ in places where Michelson wrote [u], word-initially, and as the third-person prefix. We know this because Munsee is still spoken, and audio recordings exist. Follow the links in references 71 and 72 to hear a Moriaviantown elder from the 1970s speaking this language[71] and to follow along with a word-by-word transcript.[72] Notice that members of this Moraviantown community proudly identify themselves as the Lenape people and refer to their language as *Lunaapeew*.

Goddard's review of Munsee phonology lists /wə/ as the third-person prefix.[56] This matches John O'Meara's analysis.[64] Since Michelson transcribed this Munsee prefix as [u], it is reasonable to conclude that the Mahican third-person prefix /wə/ is also transcribed using [u]. Had Michelson spent more time conducting fieldwork among Munsee Delaware and Mahican speakers, his ability to hear and transcribe aspirated phonemes would have improved.

Munsee and Mahican also have many stems featuring /wə/ as the initial phoneme. These stems were also transcribed by Michelson using [u]. When a prefix is added to a stem in /wə/ a characteristic contraction occurs. /nə/ + /wə/ contracts to /no:/, /kə/ + /wə/ contracts to /ko:/, and /wə/ + /wə/ contracts to /o:/. Cree, Shawnee, and Eastern Algonquian languages use this pattern of contraction, which Goddard has reported as a rule of Proto-Algonquian whereby the prefixes *ne-, *ke-, *we- contracted with stems in *weC to give *no:C, *ko:C, and *o:C.[82]

This contraction of /wə-wə/ to /o:/ was preserved in Michelson's Mahican transcription as [u-u] to [ō]. See examples in (21).

With regard to this phoneme, a summary of the evidence calling into question the decision made by the contractor hired to research and reconstruct Mahican may be found in Table 3.

Table 3: Evidence for the use of /wə/ instead of [o].

Fluent speakers used /wə/ when writing Mahican words.
Moravian missionaries transcribed Mahican words inconsistently using [o] instead of /wə/ when using German-language phonemes.
Michelson's Munsee transcriptions support the interpretation of Mahican work.
Reduplicated forms and forms with initial change demonstrate the existence of the /w/.
A large number of words transcribed by Swadesh and Harrington in the 1930s and 1940s use the phoneme /wə/.
Sound-blending data across all time periods is suggestive of an underlying phoneme /wə/.
Ambivalent data should not be used to override higher-quality earlier data.
Hypothesis of a sound change from /wə/ to /o/ in the 20th century must be rejected because of insufficient data and inconsistent data collected from speakers with extremely limited proficiency.

(20) Use of [u] for /wə/ in the Truman Michelson Munsee and Mahican transcriptions

(20a) Munsee 'his tail' (/wə/ as third-person prefix)

     i) [ucúkunai] (Michelson 1922, Munsee Ottawa field notes)[63]
     ii) [wshukwunay] (O'Meara 1996, Munsee Delaware dictionary, p272)[64]

(20b) 'good' (/wə/ as the inital sound of a root)

     i) [uliᵋ-] 'he is good' (Michelson 1914, Munsee Ottawa field notes)[63]
     ii) [wuliih-] (O'Meara 1996, Munsee Delaware dictionary, p362)[64]
     iii) [unē-] (Michelson 1914, *Mahican* field notes)[41]

(20c) 'too much' (/wə/ as the inital sound of a root)

     i) [usāma̲lōsō] 'he ate too much' (Michelson 1912, Munsee Kansas field notes)[73]
     ii) [wsaamuloosuw] 'overeat' (O'Meara 1996, Munsee Delaware dictionary, p353)[64]
     iii) [wəθą:mɩ] 'too much' (Swadesh 1937-38, *Mahican* field notes; Julia Palmer consultant)[28]

The Munsee transcriptions referred to as the Ottawa field notes were collected in 1922 from Moraviantown speakers in Canada by Michelson after a short trip to Ottawa, Michigan.[63] The Kansas field notes were compiled in 1912 from Munsee speakers in Kansas. Despite a gap of ten years between these datasets, Michelson transcribed Munsee words known to be aspirated using his superscript epsilon glottal stop symbol and used [u] for words known to feature /wə/. With regard to the quality of data, Michelson's visits to the Munsee were notably shorter than the four summers of fieldwork (1965-1968) Ives Goddard devoted to linguistic and ethnographic topics in preparation for his Ph.D. dissertation.[74] John O'Meara spent considerable time doing fieldwork among the Munsee Delaware in Ontario during the summers of 1980, 1981, 1984, and 1985. Additional data were collected during the fall of 1986. His thesis *Delaware Stem Morphology*, which concerns the language spoken by the Munsee, was published in 1990.[75] Another trip to the community in the 1990s contributed to his *Delaware-English / English-Delaware Dictionary*, published in 1996.[64] The use of the term "Delaware" to refer to the Munsee language reflects the depth of his collaboration with the community he worked with while gathering linguistic data. It almost goes without saying that the more time one spends immersed in the sounds of an unfamiliar language, the better the quality of hearing and transcribing those sounds accurately. None of the linguists who produced Mahican field notes spent more than a few weeks in the community and immersion was not possible for a language that was no longer spoken habitually or used socially. The valuable Munsee resources compiled by Goddard and O'Meara contain hundreds of examples of words containing /wə/ as an initial morpheme and /wə/ as the third-person prefix. Unfortunately, no linguists spent time among proficient Mahican speakers during a time when the language was used conversationally in the community. From a quality-of-data perspective, short periods of fieldwork cannot be expected to provide the same degree of accuracy of phoneme detection as fieldwork of long durations. It is unfortunate that no ranking system exists to characterize linguistic data in terms of quality.

Michelson's use of [u] instead of /wə/ in Mahican contrasts with his use of /ō/ for third-person prefix forms that attach his [u] prefix to a word already beginning with [u]. This follows the Munsee pattern of sound contraction to /ō/ when the third-person prefix /wə/ is added to a word that already begins with /wə/.

(21) Contrastive phonemes [u] and [ō] in Michelson's Mh notes
    i) [otcēmânāwa] 'they called them (pl obv)' (Michelson Mahican field notes, Folder 3.11)[25]
    ii) Analysis: |wəchi:ma:w| 'call s.o.'
    /wə-wəchi:m-ą:-na:wah/ > |o:chi:mą:na:wah|
    3p-call-direct.theme.sign-3p subordinative ending
    'They called them (obv.)'
    iii) [wunjiimeew] 'call s.o.' Munsee cognate (O'Meara 1996, Delaware dictionary, p369)[64]

Other forms of this type have been found in the Michelson Mahican notes. Below, examples of words transcribed by Swadesh and Harrington in the 1930s and 1940s are featured. Their existence proves that 20th-century speakers had not replaced /wə/ with [o] or [u] word initially or as the third-person prefix. The Harrington field notes contain only one third-person form that was transcribed using an [o]. All other third-person forms used /wə/. Several words with /wə/ as the initial phoneme can be found in Harrington. If the use of [u] or [o] had become the norm among 20th-century speakers, then Harrington should have been hearing those sounds. Instead, he was hearing /wə/.

(22) 20th-century Mh words attested with the third-person prefix /wə/
(22a) [wəθi:n] 'he said so' (Swadesh; Avery Miller)[28]
(22b) [wəda:ʔ] 'his heart' (Swadesh; Julia Palmer)[28]
(22c) [wəda:yo:m] 'his son' (Swadesh; Julia Palmer) (Notice the missing obviative suffix)[28]
(22d) [wʌton] 'his mouth' (Harrington; Webb Miller)[29]
(22e) [wəton] 'his mouth' (Harrington; Bernice Robinson)[29]
(22f) [wəpitin] 'his tooth' (Harrington; Bernice Robinson)[29]

(23) 20th-century Mh words attested with word-initial phoneme /wə/.
(23a) [wənɑksiyɑn] 'guts' |wunaksuyan| (Swadesh; Julia Palmer)[28]
(23b) [wɪθkǽnʊwʌk] 'young men' (Harrington; Webb Miller)[29]
(23c) [wʊ́nɪt] 'it is good, pretty' |wənet| (Harrington; Bernice Robinson)[29]
(23d) [wʊskáxkʌn] 'a girl' |wəsko:xkwa:n| (sg obv form) (Harrington; Bernice Robinson)[29]

Swadesh reproduced many of Michelson's transcribed words in his notes. Some items from Johann Schmick's manuscript were listed in the Swadesh field notes. In many instances, Swadesh rewrote these words using phonetic symbols he was familiar with and changed Michelson's [u] and Schmick's [o] to /wə/ for several of these words.

In summary, the linguistic evidence does not support the decision by the Mahican reconstruction program to use [o] for the third-person prefix and as a word-initial phoneme in replacement of /wə/.

Anchoring Bias

Several cognitive biases played a role in misguiding the reconstruction of Mahican. Prominent among them is the anchoring bias that tricks the mind into relying on concepts previously learned. Once a certain point of view is acquired, it can be difficult to adopt a new way of

interpreting new information. In the case of Mahican, an Eastern Algonquian language, the language contractor hired for its reconstruction had previously acquired familiarity with Ojibwe, a Central Algonquian language.[57] Although Mahican and Ojibwe are both derived from Proto-Algonquian, the differences between them are substantial. German, Swedish, and Dutch are related to English, yet they are all mutually unintelligible. For more information, consult Will Oxford's wave diagram of the Algonquian languages,[58] which is based on Goddard's 1994 data.[59]

Ojibwe influences can be found throughout the Mahican reconstruction project such as the use of [o] instead of /wə/ for the third-person prefix and vowel shortening before word-final /w/. In 2008, a Mahican-English dictionary was posted on-line by the person hired by the Stockbridge-Munsee Community. The influence of Ojibwe is obvious. The document is no longer accessible on the Internet. Most of the words listed here have since been reanalyzed and are closer to the phonemic versions listed in Table 4, but some elements of the writing system made it into the 2017 version of reconstructed Mahican along with some of the morphological features specified earlier in this paragraph. Familiarity with Eastern Algonquian phonology and paradigms is needed to facilitate the understanding of the Mahican source materials.

Table 4: Anchoring bias (Ojibwe influence)

2008 dictionary	Type of speech	Gloss	Phonemic form*
[budumawâs]	animate noun	'God'	/pą̆htamawą:θ/
[bhanem]	animate noun	'woman'	/pxānəm/
[bmesih]	AI verb	'walk, go by foot'	/pəməθih/
[dâbuwâsh]	numeral	'seven'	/tą:pawą:s/
[gaquy]	particle	'something'	/ka:kway/
[ònes'dum]	particle	'believe, obey'	/wənəstam/

*Phonemic forms are adapted from forms analyzed in Goddard 2008.[9]

Within the field of linguistics, it has been suggested that better data could result from a willingness to embrace a variety of ideas and methods, rather than rigidly adhering to one's established ways of working in the field. Flexibility is also needed when one is assessing the quality and diversity of data, since data have intrinsic characteristics but also reflect the abilities of the people collecting and analyzing the data.[60] A deliberate effort to consider the presence of cognitive biases and illusions is needed to improve scientific findings in any discipline, or they will almost certainly be missed. Since it may be difficult if not impossible to diagnose one's own biases, seeking guidance and supervision is highly recommended. Collaboration that is truly meaningful will help the identification of possible flaws in the scientific method and the presence

of thinking errors. Collaboration without a back-and-forth exchange of ideas or the active use of critical skills may be nothing more than a meaningless pseudopartnership. For collaboration to be meaningful it should be all-inclusive to the community and not selective to the point of excluding those who have the capacity to bring constructive criticism to the table.

The Confirmation Bias

Confirmation bias is a type of thinking error that makes us more likely to pay attention to data that confirms something we already believe. Incoming information is selectively filtered, and information that confirms a belief is noted and stored away for future reference, thus strengthening that belief. Information that contradicts a preestablished belief tends to be ignored or discounted, counted as spurious exceptions or anomalies to the rule. Amateur genealogy researchers may be prone to accept extremely flimsy data when it confirms their preexisting beliefs, hunches, or assumptions. Another example of this bias is the belief that girls mature faster than boys. When a girl is noticed as acting maturely, the belief strengthens. When a mature boy is seen, it is dismissed or explained away. Maturity, however, is a general term that is difficult to precisely define since it is encompasses many biological and psychological subsystems developing over an extended period of time at different rates in different people. Assessing maturity is no easy task. Emotional maturity may be underestimated in members of a family whose culture stresses the importance of keeping one's feelings private. Another family might encourage their children to speak their minds. Physical indicators of maturity may not correlate with intellectual development or the acquisition of culturally appropriate social skills. Children growing up in homes with alcohol-or substance-abusing parents may be forced to behave in ways that may be misconstrued as mature behavior, but in reality these children have suffered damage from that situation and have been deprived of certain beneficial aspects of their childhood.

The confirmation bias affected the Mahican reconstruction project. The hired contractor had acquired an unshakable belief that Mahican had developed several phonological and morphological changes by the early 20th century and had attributed them to the normal processes of language change. Consequently, phonemes and morphemes deviating from those found in older sources were interpreted as confirmatory data for the "language change" theory, and information that contradicted the theory was dismissed. The eagerness to prove a theory got in the way of an objective qualitative and quantitative assessment of the data. This bias played a role in the controversial decision to use glottal stops instead of /h/ and the substitution of [o] for /wə/, which have already been covered. Another modification of the Mahican language that corrupted its reconstruction was a systematic change in the vowel /i:/ replacing all instances of it with /e:/, based on the unsubstantiated assertion that a vowel shift had occurred in 20th-century Mahican.

The vowel /i:/ in the 20th-century source materials is rendered inconsistently. The following examples will compare historically attested words featuring this vowel with 20th-century versions.

Table 5: Rendering of /ni:mʌna:w/ 'man' (all attested 20th-century instances are listed).

Source / Date	Cited form	Phonemic form	Notes	Consultant
Historical / 1788[16]	[nemannauw]	/ni:mʌna:w/		Jonathan Edwards, Jr.
Historical / 1820[17]	[nemonnauw]	/ni:mʌna:w/		Hendrick Aupaumut
Estes in Prince / 1903[24]	[nimána]	/ni:mana/	4 instances; obviative form	Dennis Turkey
	[nemanaák]	/ne:mana:k/	5 instances; plural form	Dennis Turkey
Michelson / 1914[25]	[nēmänau]	/ne:mena:w/	11 instances of [nēm-]	William Dick
	[nīmänau]	/ni:mena:w/	4 instances of [nīm-]	William Dick
	[nīma̠náu]	/ni:məna:w/	2 instances	Sot Quinney
	[nīmänau]	/ni:mena:w/	1 instance	Sterling Peters
	[nēma̠ñāo]	/ne:məna:w/	1 instance	Alfred Miller
Swadesh / 1930s[28]	[nemanâ:o]	/ne:mana:w/	1 instance	Julia Palmer
	[ni:mana:o]	/ni:mana:w/	4 instances of [ni:m-]	Julia Palmer
	[né:mɑnao]	/ne:məna:w/	7 instances of [né:m-]	Avery Miller
	[ni:mɑna:o]	/ni:məna:w/	2 instances of [ni:-]	Avery Miller
	[kni:mana:úm]	/kni:mana:m/	2s possessive	e3.2
	[ni:mɑna:o̦]	/ni:məna:w/	2 instances	Webb Miller
	[nemonow]	/ni:mana:w/	Self-transcribed	William Dick
Harrington / 1949[29]	[nɪmʌna:w]	/nɪmʌna:w/	1 instance	Webb Miller
	[ní:mʌnʌxʌm]	/ní:mʌnʌxʌm/	'male animal'	Webb Miller
	[nīmʌnaw]	/ni:mʌnaw/	1 instance	Bernice Robinson

Truman Michelson's consultants showed variability in their use of the /i:/ vowel. William Dick, the most proficient speaker who worked with Michelson, used the word /ni:mʌna:w/ twice in one of his sentences. One instance was transcribed using /e:/ and the other used /i:/ in the first

syllable. Since the most skilled speaker of the 20th century was inconsistent in the way this vowel was pronounced, it is difficult to conclude that a vowel shift had occurred. Historically solid /i:/ is the more reasonable vowel to use for Mahican reconstruction, in my opinion.

Although the number of times this word was encountered with /i:/ vs. /e:/ is reported in Table 5, these data should be interpreted with caution. Had Michelson transcribed several hundred instances of words with these sounds, the frequency data would undoubtably differ and could even reach a point of statistical significance. Alternatively, if we were to possess historical data from a hundred of speakers, we would have much clearer understanding of possible historical variations in Mahican phonology. It is wise to be cautious when interpreting data from a small number of occurrences to avoid making faulty conclusions. This is similar to flipping a coin. It may take a large number of flips to obtain anything close to a 50-50 ratio.

Since there was an intermittent variation in the pronunciation of this vowel, could it represent evidence of a prodromal vowel shift destined to eventually become generalized? I would concede that the possibility should be considered, but I would expect the sound to show signs of increasing levels of generalization over time. Such a generalization is not attested in the data collected in the 1930s and 1940s. Since the Mahican vocabulary collected in the 20th century was fragmentary and inconsistent in phonology and morphology, it is impossible to establish with certainty what exactly caused the changes found in the data.

Linking cause to an effect is difficult in any scientific discipline. It can be shown that the intelligence quotient (IQ) of a child correlated to his or her shoe size, an absurd example of an illusory correlation. Brain-maturation processes account for the rising IQ, and this runs parallel to the growth of the child's body including the feet. Natural processes of language change occur in living languages actively used in a community, which was not the case for Mahican in the year 1914 or thereafter. Nobody would attribute changes in human physiology identified in a dozen or so survivors of a nuclear holocaust to natural biological evolution. A diagnosis of sequelae of radiation exposure would be more appropriate and more accurate.

In addition to the lack of generalization of changes such as /o/ prefixes, glottal stops, and vowel variations, there is another clue that points toward language decline as an explanation for the changes. There were no /e:/-only speakers contrasting with speakers who preferred /i:/. The consultants interviewed between 1914 and 1949 varied from day to day and from word to word in their pronunciation of the vowel /i/, assuming that the linguists had impeccable and infallible auditory and sound-detection skills. The lack of speaker consistency especially becomes apparent when several words featuring the /i:/ phoneme are analyzed.

Table 6: Rendering of /ni:sah/ 'two' (all attested 20th-century instances are listed)

46

Source /Date	Cited form	Phonemic form	Notes	Consultant
Historical / 1788[16]	[neesoh]	/ni:sah/		Jonathan Edwards, Jr.
Historical / 1820[17]	[nesah]	/ni:sah/		Hendrick Aupaumut
Estes in Prince / 1903[24]	[nethwak]	/ne:θwʌk/	verbal form; 'two of s.t. animate'	Dennis Turkey
Michelson / 1914[25]	[nēsäᵋ]	/ne:seʔ/		William Dick
	[nīsa]	/ni:sa/		Sot Quinney
	[nīswa̲kʻ]	/ni:swəkʰ/	verbal form; 'two of s.t. animate'	Sterling Peters
	[nisa]	/nisa/		Edwin Miller
	[nisaᵋ]	/nisaʔ/		Bernice Robinson
	[nīsá]	/ni:sa/		Alfred Miller
Siebert / 1930s[26]	[ni:səʻ]	/ni:səh/	aspiration	Bernice Robinson
Swadesh / 1930s[28]	[ni:sa]	/ni:sa/	3 instances, once for each consultant listed	Julia Palmer, Bernice Robinson, Avery Miller
	[ni:sna]	/ni:sə̆na/	verbal form; 'two of s.t. inanimate'	Avery Miller
	[ni:sno]	/ni:sno/	verbal form; 'two of s.t. inanimate'	Avery Miller
	[nísa]	/nisa/		e6.8
Harrington / 1949[29]	[ní :sá']	/ni:sáʔ/	once	Webb Miller
	[ni :swʌk]	/ni:swʌk/	verbal form; 'two of s.t. animate'	Webb Miller
	[ni:sa]	/ni:sa/		Bernice Robinson

Alfred Miller, who had pronounced /ni:mʌna:w/ 'man' with an /e:/ pronounced /ni:sah/ 'two' with /i:/. Only one speaker used /e:/ to pronounce the numeral 'two'. Had more data been collected this ratio may not have been so one sided.

Table 7: Rendering of /si:pəw/ 'river' (all attested 20th-century instances are listed)

Source /Date	Cited form	Phonemic form	Notes	Consultant
Historical / 1788[16]	[sepoo]	/si:pəw/		Jonathan Edwards, Jr.
Estes in Prince / 1903[24]	[thépo]	/θe:po/	1 instance	Dennis Turkey
Michelson / 1914[25]	[θēpōkᶜ]	/θe:po:kᶜ/	locative form	William Dick
	[θēpō]	/θe:po:/		William Dick
	[sīpōkᶜ]	/si:po:kᶜ/	locative form	Sterling Peters
	[θīpō]	/θi:po:/	once for each consultant listed	Edwin Miller, Alfred Miller
Swadesh / 1930s[28]	[thēpow]	/θe:pow/		Julia Palmer
	[θi:po:θ]	/θi:po:θ/	diminutive form	Julia Palmer
	[θi:po:k]	/θi:po:k/	locative form	Avery Miller
	[thepow]	/θi:pəw/	self-transcribed	William Dick
	[si:pú:s]	/si:pú:s/	diminutive form	e8.17
	[si:pú]	/si:pú/		e8.15
	[si:pwán]	/si:pwán/	plural forms; shows final silent /w/ of sg	e8.15
	[seepo]	/si:po/	English phonemes	Charles E. Brown
Harrington / 1949[29]	[θípʊ]	/θípʊ/		Webb Miller
	[θípʊ:k]	/θípʊ:k/	locative form	Webb Miller
	[sipʊ]	/θipʊ/		Bernice Robinson

An interesting observation is that Harrington in 1949 used the vowel /i:/ to transcribe all three of the words used for the examples above. By 1949, a vowel shift should have become generalized, but exactly the opposite was documented in the linguistic field notes.

Goddard 2008 does not list /e/ or /e:/ as a possible vowel for Mahican.[9] Scientifically, there are not enough data to clearly support a vowel shift for /i/ to /e/, and it is plausible that the hired language contractor's theory of diachronic changes in Mahican influenced his interpretation of the linguistic data by way of a confirmation bias.

Other Biases Relevant to the Mahican Project

A bias known as the *overconfidence effect* may have influenced the language contractor's decision to work unguided and unsupervised. Although prompted in the year 2017 to review Goddard's 2008 paper and to include some of the insights about the Mahican language omitted in his early reconstruction work, the contractor declined to do so.[9] At that time, he was working on a dissertation on the topic of the diachronic phonology of Mahican. Several people including this writer suggested that he contact Ives Goddard and Carl Masthay by e-mail to obtain feedback about his theories of language change. Both Goddard and Masthay confirmed by personal communication with this writer that no contact concerning the dissertation or regarding the language reconstruction project was initiated by the contractor. This deliberate choice has disturbing implications, ethically and scientifically. The number of scholars with advanced knowledge of Mahican is essentially limited to these two linguists. It is difficult to understand why a linguist-in-training working on a Mahican language reconstruction project or on a dissertation devoted to Mahican would deliberately avoid obtaining feedback from eminently qualified scholars such as Masthay and Goddard.

(24) Examples of reconstruction errors easily verifiable in Goddard's analysis.[9]
(24a) Shortened versus preserved long vowel before word-final /w/.
      i) [neemunaw] 'man' /ne:manaw/ (shortened; 2017 Mahican Reconstruction Project)
      ii) [nemannauw] 'man' /nīmanāw/ (preserved; J. Edwards, Jr.; analyzed by Goddard)[9]
      iii) [nɪmʌnaˑw] 'man' (preserved; Harrington Mahican field notes, 1949)[29]
(24b) Incorrect vowel of the "n-endings."
      i) [sta ktaakhootaawon] 's/he is not hanging something up' (2017 Mahican Project)
      ii) [əstah kwāwihtāwən] 'you (sg.) don't know it' (Goddard 2008)[9]
(24c) Incorrect TA conjunct mode direct 1s-3s form.
      i) [aʔwãanuk] 'my beloved' (incorrect /ak/ ending; 2017 Mahican Project)
      ii) [wītawāmąyą] 'my wife' (correct ending /ąh/; Goddard 2008)[9]
      iii) [achwahnája] 'my beloved' |ąhwą:ną:yah| (correct ending /ąh/; Christ's Passion 30.13)[33]

Scores of other errors that contradict the Mahican source data or deviate from Goddard's high-quality analysis have been identified in the contractor's work.

It cannot be assumed, however, that overconfidence was the sole explanation for opting out of a collaboration with these esteemed scholars. Psychological factors may have played a role, since sometimes a dogged determination to prove oneself to be self-reliant, capable of figuring things out without outside assistance, can stem from a fear of being judged inadequate. Defensiveness and a sensitivity to criticism are clues to this type of personal psychology. Other psychological pathways may have played a role in the decision of this person to work alone and unguided.

The overconfidence bias instills an exaggerated belief in the correctness of one's thoughts, assumptions, and reasoning skills. I wish I could say I was unaffected by it, but in fact none of us is free of unconscious biases or proneness to illusions. The term *objectivity illusion* has been proposed to describe the belief that we are more likely to identify biases in others than in ourselves. Biases are part of the human condition, and awareness of them does not render us

immune from them. We cannot objectively smell our own bodies, nor can we hear the sounds of own voices. It is difficult to picture ourself as others see us. Many top performers avoid watching their own performances, even though the rest of us find them delightful, because the only things they notice are the flaws.

People who are acutely aware of their shortcomings may have an easier time learning the value of collaboration. The human capacity for humility has variable expression along a continuum. It may not reflect the true capabilities of a person since even exceptionally gifted people, performers, scholars, and most mothers harbor doubts about their true competence. This is sometimes referred to as the *imposter syndrome.* At the far end of the spectrum*,* near-continual rumination about one's abilities, attractiveness, or potential can impair one's quality of life and may require treatment from a qualified mental health professional. In this modern world where our culture tends to idealize superheroes and celebrities, average to above-average proficiencies are not good enough. One social misstep can have terrible consequences on the youth of our society. One close call from a medical error or an adverse unanticipated outcome such as a death by suicide of a patient can shatter the confidence of a competent seasoned health professional.

Conversely, it is possible to have an inflated opinion of one's beauty, intelligence, or overall competence that leads to an unawareness of our true shortcomings.

The only (partial) antidote to our unconscious biases is to partner with others and to be open to accepting feedback. In some cases, the partner could be a device or an instrument, such as a musician using a metronome to perform with rhythmic precision or a pilot using data from an instrument rather than flying by the seat of one's pants.

Partnering with others is no sign of weakness, rather it is an indicator of strength and wisdom. When we admit our vulnerabilities and blind spots, invariably others pitch in to support, assist, and sustain us.

Opening the door to criticism also opens the door to nurturing. Let us all remind ourselves to nurture our colleagues. Those who may seem to need it the least may actually be the ones who need it the most.

Spin

At the crossroad of ethics and cognitive biases lies another trap for scientific researchers, the optimal way to present the conclusions of a study.[42] Unfortunately, many choose to spin the results, exaggerating the results using misleading word choices. Up to half of the studies published in top psychiatry and psychology journals in a recent review had abstracts that used spin to dissimulate nonsignificant results.[77] Although editors of journals bear some responsibility for what gets published, there is a type of spin for which there is no safety net, a type of inadvertent spin attributable to cognitive biases. For example, doctors practicing medicine in settings where diseases are more severe, such as an academic hospital setting, may provide more

grim prognostic assessments than those who practice general medicine in a small community clinic.[65] Conversely, doctors may dismiss the risk of a potentially lethal medication interaction because they have been practicing in a setting where the prevalence of such complications is uncommon.

Strongly asserted claims from a person in a position of power may be difficult to challenge. Spin may be used to minimize the risks of taking a certain medication or when obtaining consent for a procedure. If challenged, some doctors will resort to medical gaslighting, insinuating that a layperson lacks the competence to question a medical professional or overwhelming the person with medical jargon that is impossible to follow or process.

The Mahican reconstruction project represents an inglorious example of linguistic spin. The contractor used his influence to lead the initial group of language learners to adopt a so-called 20th-century pronunciation pattern for the teaching curriculum of their revitalized language using the argument that doing so would show respect to the elders of the tribe. The learners were not informed that language obsolescence had resulted in a wide range of pronunciations, inconsistent enough to not warrant the use of the word "pattern" to describe them. Instead, certain variant pronunciations were selected for use in the reconstructed language, /o/ for /wə/, /e/ for /i/, and /ʔ/ for /h/. Not all of the phonological choices that were incorporated into the Mahican language have been included in this paper.

Serious sociocultural harm has occurred because of the breaches in ethical behavior, the lack of awareness of cognitive biases, and the willingness to resort to linguistic spin. Controversy over the language reconstruction project has caused a rift in the tribe that may be very difficult to resolve.

Assessment of Needs

The Mahican language project is in dire need of remediation. When it comes to human speech, it is not possible to identify correctness in absolute terms. It is reasonable to accommodate variations in pronunciation patterns.

An advanced student of French opted for a year of study abroad. The first month was difficult, since spoken French is quite different from grammatically correct written French. The student was placed in a family for the first month to create an immersive environment. The man of the family was a truck driver who used a very colorful and idiomatic version of the language. When the student began using these speech patterns riddled with profanity in church, a faculty mentor had to intervene and explain that this type of language was inappropriate for this setting. He provided a small yellow book that explained that French has several "levels" of language, each more or less appropriate depending on a given setting.[78] Goddard described this same concept in more than one of his papers, using the terminology "deliberate vs. casual style."[79, 80] It is possible that some of the pronunciation variations encountered in the Mahican 20th-century materials

represent less formal ways of speaking. When there are data in support of it, variants should not be rejected but listed and identified as such, optimally including an indicator of the style.

(25) Examples of casual vs. formal speech in French.
(25a) Je ne sais pas. 'I do not know' (formal, literary use, rarely spoken)
(25b) Je sais pas. [ʃ‿sɛ pa] 'I don't know' (casual, often spoken)
(25c) J'sais pas. [ʃɛ pa] 'I dunno' (more casual, most often spoken version)
(25d) Je n'y traves que dalle. 'I'm clueless' (slang)
(25e) que dalle 'clueless' (truncated slang)

(26) Mahican examples of casual vs. formal speech.
(26a) 'earth, land, ground'
      i) [ki:] (casual form; Swadesh field notes; Julia Palmer)[28]
      ii) [áxkəy] (formal form; Harrington field notes; Bernice Robinson)[29]
(26b) 'Thanks!'
      i) [n̠í:wi:] (casual form; Swadesh field notes; Bernice Robinson by Siebert)[26]
      ii) [wəni:wɪ] (formal form; Swadesh field notes; Julia Palmer)[28]

Answers are needed for questions about how to identify the differences in phonology and morphology found in the Mahican source materials. How does one determine the degree of formality of the word as opposed to other explanations such as shifts based on language obsolescence, differences in elicitation methods of the original linguists, variable sound differentiation skills of the transcribers, rusty enunciation efforts on the part of the consultants, cross-contamination with other languages more widely spoken in the area, or normal variants of the spoken language? Is an educated guess good enough? Should an educated guess be promulgated as "fact" leaving no room for dissension?

If five qualified linguists were plopped into a community speaking a language unfamiliar to them, would all five transcribe words the same way? Would their initial attempts differ from later attempts? How much time would it take to become attuned to the phonemes in order to hear them and record them accurately and consistently? Would a blind linguist fare better than one with 20-20 vision? What data would be lost and what would be gained under that scenario? Would data pooled from all five linguists strengthen the data, or would it confuse things? What if each linguist refused to share notes or thoughts with the others, would the results be superior? Would a linguist with a preference for one particular theory hear words differently from a linguist from the opposing camp? Would it matter who is funding the research? Would the ultimate agenda of the project influence the outcome? Would the size of the community matter? Should data from semiproficient speakers be considered of equal value to data from fully proficient speakers? Would any of the linguists qualify their data as uncertain or ambivalent without being prompted to do so?

Some answers to these questions can be found in textbooks and published articles, yet information from the knowledge base were not effectively applied to the sociocultural work of revitalizing the slumbering Mahican language, a sad reminder that more awareness is urgently

needed. Illusions, cognitive biases, and inadequate interpersonal communication skills affect all disciplines, and for branches of science such as medicine or aviation where the lives of people are at stake, education about these factors should be a top priority. Employees of government regulatory entities also have enormous responsibilities to the general public since they are charged with the oversight of the foods we consume, the medications we take, the air we breathe, and the cars we drive. We need to know that they have been trained in critical thinking skills and awareness of cognitive biases beyond the recent trend toward implicit bias training to reduce stereotyping, discrimination, and prejudice.

Summary

The primary purpose of this case study was to highlight the effect of cognitive biases and ethics as they pertain to the project of researching, reconstruction, and revitalizing an indigenous language for a community. Lessons from medical and aviation science were used to illustrate the main points and to demonstrate the absence of convincing evidence that the science of linguistics is relatively more affected than other branches of science.

The quality of linguistic research cannot be attributed to the replicability of the findings since replication may not be possible with many forms of linguistic data. Attentiveness to the agenda of the researcher(s), the study's methodology, and a data-quality assessment can have a large influence on the accuracy of the purported findings. Awareness of common cognitive biases and illusions may produce higher-quality data and more robust research findings. Critical appraisal of research studies and tests will also benefit from an awareness of thinking errors and the limitations of statistical analyses.

The concept of collaboration may need to be revisited. Meaningless collaboration with persons lacking the expertise to question or challenge a language expert should be replaced with *meaningful collaboration* inclusive of all community members known to have language interest and knowledge and must involve experienced linguists providing guidance and supervision for culturally sensitive work.

Indigenous communities that are considering hiring a language expert would benefit from more specific guidance intended to ensure that high-quality work will be accomplished.

Potential guidance could cover topics such as the following:

1. Anticipating the need for quality-control reviews of the linguistic work by experienced, independent, and impartial linguists.
2. Ensure the provision of guidance or oversight when a linguist-in-training is hired for a language reclamation project.
3. Pointers to ethical resources for tribes who have questions about the conduct or quality of work produced by the person entrusted with the reconstruction of their language.

4. Outline for the drafting of ethical guidelines to be used within the community governing people conducting scientific fieldwork.
5. Requiring written documentation for language reconstruction work, with words, suffixes, and grammatical and phonological rules properly referenced to the source materials.
6. Whenever possible involve a team-based approach including at least one community member.
7. Explore whether sensitive work capable of causing personal or cultural harm should be reserved for specially licensed or trained linguistic practitioners.
8. Assume that cognitive biases *will* influence the linguistic and administrative decisions made.
9. Require the language expert to obtain debiasing training.[81]
10. Identify "red flags" susceptible of generating controversy and costly mistakes such as a contractor's insistence on a solo work ethic, an unwillingness to communicate with those who do or might question the work, and the lack of willingness to produce supporting documentation of key language reconstruction decisions.
11. Anticipate the need for a collaborative process for vetting and incorporating loan words and productive word processes into the revitalized language.
12. Be aware of the dangers of putting key language-program decisions in the hands of a small number of persons lacking language expertise and insist on a shared decision-making process including at least one person knowledgeable about language matters.

More training in critical thinking skills, cognitive biases, logical fallacies, and illusions should be considered as additions to linguistic and other scientifically oriented academic curricula. Guidelines for standardized elicitation methods that explore the relationship between the data and the data collector in great detail might benefit from the knowledge base of medical science and aviation science. Use of a hierarchy to describe evidence-based data as in medicine and psychology would be a welcome addition to the linguistics toolbox.

References

1. Breyl, Michael. 2023. The linguist's guide to human fallibility and biases: their evolution, cognitive significance and impact in decision making. *Linguistische Treffen in Wrocław*, Vol. 23(I). https://doi.org/10.23817/lingtreff.23-1.

2. Matute, H., Blanco, F., Yarritu, I., Díaz-Lago, M., Vadillo, M.A., Barberia, I. 2015. Illusions of causality: how they bias our everyday thinking and how they could be reduced. *Frontiers in Psychology* 6:888. https://doi.org/10.3389/fpsyg.2015.00888

3. Dobyns, Henry F. 1976. *Native American historical demography.* Bloomington, IN: Indiana University Press.

4. Dobyns, Henry F. 1966. Estimating aboriginal American population. an appraisal of techniques with a New Hemispheric estimate. *Current Anthropology* 7:395-416.

5. Denevan, William M. 1976. *The native population of the Americas in 1492*. Madison, WI: University of Wisconsin Press.

6. Smith, David Michael. 2017. Counting the dead: estimating the loss of life in the indigenous holocaust, 1492-present. *Proceedings of the Twelfth Native American Symposium*. Houston, TX: University of Houston-Downtown.

7. Swadesh, Morris. 1948. Sociologic notes on obsolescent languages. *International Journal of American linguistics* 14(4):226-235.

8. United States Congress. 1881. *Miscellaneous documents of the House of Representatives for the Third Session of the Forty-Sixth Congress, 1880-'81*. Washington, D.C: Government Printing Office. https://books.google.com/books?id=UawBovX6gaQC&dq=bill+hr+3678++ +46th+congress&source=gbs_navlinks_s (Accessed 2023-11-5). Alternative link: https://shareok.org/bitstream/handle/11244/35413/Senate-48-2-Miscellaneous-61-Serial-2265.pdf?sequence=1 (Accessed 2024-02-11).

9. Goddard, Ives. 2008. Notes on Mahican: dialects, sources, phonemes, enclitics, and analogies. In Karl S. Hele & Regna Darnell (eds.). *Papers of the 39th Algonquian Conference*. London, Ont.: The University of Western Ontario, pp. 246-315.

10. Cole, Beth. 2013. Grammatical change in a not so dying dialect: genitive mutation in Uist Gaelic. In Janet Cruickshank and Robert McColl Millar (eds.). *After the storm: papers from the Forum for Research on the Languages of Scotland and Ulster triennial meeting, Aberdeen 2012*. Aberdeen: Forum for Research on the Languages of Scotland and Ireland, 117-139. ISBN: 978-0-9566549-3-9.

11. Perley, Bernard C. (bcperley@uwm.edu) (2012). Zombie linguistics: experts, endangered languages and the curse of undead voices. *Anthropological Forum* 22(2):133-149; doi: 10.1080/00664677.2012.694170.

12. Sergeant, John (1765a?) *A morning prayer, an evening prayer, catechism*. Boston.

13. Schmick, Johann Jacob (n.d., after 1754). *Miscellanea linguae nationis Indicae Mahikan dictae, curā susceptā ā Joh. Jac. Schmick*. Philadelphia, PA: American Philosophical Society.

14. Archives of the Moravian Church, Bethlehem, Pennsylvania (box 331, folder 5).

15. Heckewelder, John G.E. (n.d.). *Mahicanni words. Taken down from the Mouth of one of that Nation, who had been born in Connecticut*. Philadelphia, PA: American Philosophical Society.

16. Edwards, Jonathan, Jr. 1788. *Observations on the language of the Muhhekaneew Indians.* https://archive.org/details/observationsonla01edwa/page/n11/mode/1up (Accessed 2023-12-10).

17. Aupaumut, Hendrick. 1795. *The Assembly's catechism*. Stockbridge, MA. https://content.wisconsinhistory.org/digital/collection/tp/id/29141 (Accessed 2023-12-10).

18. Jones, Electa F. 1854. *Stockbridge, past and present, or, Records of an old mission station.* Springfield, MA: S. Bowles & Company.

19. Barton, M.D., Benjamin Smith. 1798. *New views on the origin of the tribes and nations.* Philadelphia, PA: Printed, for the author by John Bioren.

20. Jenks, William. 1804. Language of the Moheagans. *Collections of the Massachusetts Historical Society* IX:98-99.

21. Jefferson, Thomas. 1793-1808. *Comparative vocabulary: Mohiccon and unidentified languages.* text:156410. Philadelphia, PA: American Philosophical Society.

22. Morse, Jedidiah. 1822. *A report to the Secretary of War of the United States on Indian affairs.* New Haven, CT, pp. 152-154.

23. Morgan, Lewis H. 1870. *Systems of consanguinity and affinity of the human family.* Smithsonian Contributions to Knowledge, Vol. XV.

24. Prince, J. Dyneley. 1905. A tale in the Hudson River Indian language. *American Anthropologist,* new series, 7(1):74-84.

25. Michelson, Truman. 1914. *Stockbridge notes and texts, with copies by Frank Speck.* NAA MS 2734, folders 1-4. National Anthropological Archives, Smithsonian Institution.

26. Siebert, Frank T., Jr. *circa* 1935. *Mahican field notes.* Copied in Swadesh mss. Philadelphia, PA: American Philosophical Society. See Ref. 28.

27. Eggan, Olive. 1930. *Notes from William Dick.* Copied in Swadesh mss. Philadelphia, PA: American Philosophical Society. See Ref. 28.

28. Swadesh, Morris. (n.d.) Mahican Section of the ACLS Collection (American Council of Learned Societies Committee) on Native American Languages. Philadelphia, PA: American Philosophical Society. Mss.497.3.B63c, items A1k.1-4.

29. Harrington, John Peabody. (n.d.) *Papers of John P. Harrington.* NMNH-Harrington_mf6_r10, r11 and r12, National Museum of Natural History, National Anthropological Archives.

30. Davidson, John Nelson. 1893. *Muh-he-ka-ne-ok, a history of the Stockbridge nation.* Milwaukee, WI: S. Chapman. https://archive.org/details/muhhekaneokhisto00davi/page/n5/mode/2up (Accessed 2023-12-02).

31. Wolf, Anthony E. 1991. *Get out of my life, but first could you drive me & Cheryl to the Mall?* The Noonday Press. New York: Farrar, Straus and Giroux.

32. Warne, Janet. 1980. Time-depth in Mahican diachronic phonology: evidence from the Schmick manuscript. In William Cowan (ed.). *Papers of the Eleventh Algonquian Conference* 11:166-182. Carleton University, Ottawa.

33. Masthay, Carl. 1980. *Mahican-language hymns, biblical prose, and vocabularies from Moravian sources, with 11 Mohawk hymns (transcription and translation).* St. Louis, self-published at 1000 copies, LC Cat. Card No. 80-82410, pp. 47 (errors and revision sheets are available from the author).

34. Proulx, Paul. 1983. Mahican social organization and the Middle Atlantic Algonquian cultural climax. *Anthropological Linguistics* 25(1):82-100. The Trustees of Indiana University on behalf of *Anthropological Linguistics*. Stable URL: http://www.jstor.org/stable/30027658.

35. Masthay, Carl. 1986. Proper readings for the two forms of Zeisberger's Maqua-Delaware-Mahican vocabulary. *International Journal of American Linguistics* 52(2):172-181. The University of Chicago Press. Stable URL: http://www.jstor.org/stable/1265376.

36. Masthay, Carl. 1991. *Schmick's Mahican dictionary*. Philadelphia, PA: American Philosophical Society.

37. Pentland, David. 1991. Mahican historical phonology. Pp. 15-27 in Masthay 1991. See reference 36.

38. Yeh, Robert W., et al. 2018. Parachute use to prevent death and major trauma when jumping from aircraft: randomized controlled trial. *BMJ* [*British Medical Journal*] 363:k5094. http://dx.doi.org/10.1136/bmj.k5094.

39. Morgan, Daniel J., et al. 2018. 2017 Update on medical overuse: a systematic review. *JAMA Intern Med* 178(1):110-115; doi: 10.1001/jamainternmed.2017.4361.

40. Linguistic Society of America. 2019. *Revised ethics statement.* Linguistic Society of America, New York and Washington, D.C.

41. D'Arcy, Alexandra, and Bender, Emily M. 2023. Ethics in linguistics. *Annual Review* 9:49-69. https://doi.org/10.1146/annurev-linguistics-031120-015324.

42. Zook, M., Barocas, S., Boyd, D., Crawford, K., Keller, E., et al. 2017. Ten simple rules for responsible big data research. *PLOS Comput Biol* 13(3):e1005399.

43. James, John T. 2013. A new, evidence-based estimate of patient harms associated with hospital care. *Journal of Patient Safety* 9(3):122-128; doi: 10.1097/PTS.0b013e3182948a69.

44. Rice, Keren. 2011. Ethical issues in linguistic fieldwork. In Nicholas Thieberger (ed.). *The Oxford handbook of linguistic fieldwork.* Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199571888.013.0019.

45. Rice, Keren. 2011. *Documentary linguistics and community relations.* Honolulu, HI: University of Hawaiʻi Press. 5:187-207. http://hdl.handle.net/10125/4498 (Accessed 2024-02-04).

46. Federal Aviation Administration. 2023. *Pilot's handbook of aeronautical knowledge.* Chapter 2, Figure 2-4. United States Department of Transportation, Federal Aviation Administration, Oklahoma City, OK.

47. Thomason, Lucy G. 2003. *The proximate and obviative contrast in Meskwaki.* The University of Texas at Austin Ph.D. dissertation.

48. Eckert, Penelope. 2003. Research ethics in linguistics. In Robert Podesva and Devyani Sharma (eds.). *Cambridge handbook in research methods in linguistics.* Cambridge University Press.

49. Goddard, Ives. 1990. Paradigmatic relationships. *Proceedings of the Sixteenth Annual Meeting of the Berkeley Linguistics Society: Special Session on General Topics in American Indian Linguistics,* pp. 39-50. Berkeley, CA: Berkeley Linguistics Society.

50. Dorian, Nancy C. 1973. Grammatical change in a dying dialect. *Language* 49(2):413-438. Linguistic Society of America, New York and Washington, D.C.

51. Grant, Anthony P., and Costa, David J. 1991. Some observations on John P. Harrington's Peoria vocabulary. *Anthropological Linguistics* 33(4, Winter):406-436. The Trustees of Indiana University on behalf of *Anthropological Linguistics*.

52. Mansfield, John, and Stanford, James. 2017. Documenting sociolinguistic variation in indigenous communities: practical methods and solutions. In Kristine Hildebrandt, Carmen Jany, and Wilson Silva (eds.). *Language documentation and conservation,* Special Publication No. 13, pp. 116-136.

53. McGurk, Harry, and MacDonald, John. 2009. Hearing lips and seeing voices. *Nature* 264:746-748. https://doi.org/10.1038/264746a0.

54. MacDonald, John. 2018. Hearing lips and seeing voices: the origins and development of the "McGurk efect" and reflections on audio-visual speech perception over the last 40 years. *Multisensory Research* 31:7-18.

55. Sekiyama, K., Tohkura, Y., and Umeda, M. 1996. A few factors which affect the degree of incorporating lip-read information into speech perception. *Proceedings of the Fourth International Conference on Spoken Language Processing. ICSLP '96*, Philadelphia, PA, USA, 3:1481-1484; doi: 10.1109/ICSLP.1996.607896.

56. Goddard, Ives. 1982. The historical phonology of Munsee. *International Journal of American Linguistics* 48(1):16-48. The University of Chicago Press. http://www.jstor.org/stable/1264746 (Accessed 2024-01-22).

57. Ioannidis, J.P.A. 2005. Why most published research findings are false. *PLoS Med* 2(8):e124.

57. Oxford, Will. 2019. Algonquian. In Daniel Siddiqi, Michael Barrie, Carrie Gillon, Jason Haugen, and Eric Mathieu (eds.). *Routledge handbook of North American languages*. https://home.cc.umanitoba.ca/~oxfordwr/papers/Oxford_Algonquian_Routledge.pdf (Accessed 2024-02-04).

58. Oxford, Will. 2023. *Wave diagrams for the Algonquian family*. Manuscript, University of Manitoba. http://home.cc.umanitoba.ca/~oxfordwr/algling/wavediagrams.html (Accessed 2024-02-01).

59. Goddard, Ives. 1994. The west-to-east cline in Algonquian dialectology. In William Cowan (ed.). *Actes du 25e Congrès des Algonquinistes* 187-211. Carleton University, Ottawa.

60. Schwarz-Friesel, Monika. 2012. *On the status of external evidence in the theories of cognitive linguistics: compatibility problems or signs of stagnation in the field? Or: why do some linguists behave like Fodor's input systems?* Technical University of Berlin, Institute of Languages and Communication, Straße des 17. Juni 135, D-10623 Berlin, Germany. https://doi.org/10.1016/j.langsci.2012.04.007.

61. Quinney, John W. 1854. *Fourth of July speech.* https://content.wisconsinhistory.org/digital/collection/whc/id/553 (Accessed 2025-11-23).

62. Michelson, Truman. 1913. *Preliminary report on the linquistic classification of Algonquian tribes.* Washington, D.C.: Government Printing Office.

63. Michelson, Truman. 1922. *Linguistic and ethnological notes on Ottawa and Munsee.* NAA ms 163. National Anthropological Archives, Smithsonian Institution.

64. O'Meara, John. 1996. *Delaware-English / English-Delaware dictionary.* University of Toronto Press, Toronto, Ont.

65. Morgan, Daniel J., et al. 2021. Accuracy of practitioner estimates of probability of diagnosis before and after testing. *JAMA Intern Med* (6):747-755; doi:10.1001/jamainternmed.2021.0269.

66. Link to audio files of the words cited in the examples (15a-d). https://munseedelaware.com/wp-content/uploads/2024/03/munsee-delaware-examples.mp3 (Last accessed 3/2/2024).

67. Harrington, John P. 1987. The papers of John Peabody Harrington in the Smithsonian Institution. A guide to the field notes. In Elaine L. Mills and Ann J. Brickfield (eds.). *An official inventory for the microfilm edition of Harrington's papers in the Smithsonian Institution, 1907-1957.* National Anthropological Archives, Department of Anthropology, National Museum of History, Washington, D.C.

68. Grieve, Jack. 2021. Observation, experimentation, and replication in linguistics. *Linguistics* 59(5):1343-1356. https://doi.org/10.1515/ling-2021-0094.

69. Lehrman, Nathaniel S. 1993. Pleasure heals: the role of social pleasure—love in its broadest sense—in medical practice. *Arch Intern Med* 153(8):929-934; doi: 10.1001/archinte.1993.00410080005001.

70. Jones, Mark. M., Netterville, John T., Johnston, David O., and Wood, James L. 1972. *Chemistry, man and society.* Philadelphia, PA: W. B. Saunders Co.

71. https://globalrecordings.net/en/program/17751 (Last accessed 2/18/2024).

72. Link to transcript of Noah Story. https://munseedelaware.com/mahican-resource-articles/the-story-of-noah/ (Last accessed 3/02/2024).

73. Michelson, Truman. 1912-1913. *Field notes from the Munsee in Kansas and the Delaware in Oklahoma.* NAA ms 2776, folders 1-13, National Anthropological Archives, Smithsonian Institution.

74. Goddard, Ives. 1979. *Delaware verbal morphology: a descriptive and comparative study.* New York: Garland Publishing.

75. O'Meara, John. 1990. *Delaware stem morphology.* Thesis. McGill University, Montreal, Quebec.

76. Oxford, Will. 2015. Patterns of contrast in phonological change: evidence from Algonquian vowel systems. *Language* 91(2):308-357. Linguistic Society of America, New York; doi: https://doi.org/10.1353/lan.2015.0028.

77. Jellison, S., Roberts, W., Bowers, A., et al. 2020. *Evaluation of spin in abstracts of papers in psychiatry and psychology journals. BMJ* [*British Medical Journal*] *Evidence-Based Medicine* 178-181. https://doi.org/10.1136/bmjebm-2019-111176.

78. Abbadie, Ch., Chovelon, B., and Morsel, M.H. 1976. *L'Expression Française écrite et orale*. Grenoble, Isère, France: Presses Universitaires de Grenoble.

79. Goddard, Ives. 1988. Stylistic dialects in Fox linguistic change. In Jacek Fisiak (ed.). *Historical dialectology* 37:193-209. Berlin: De Gruyter Mouton. https://doi.org/10.1515/9783110848137.193.

80. Goddard, Ives. 2010. Linguistic variation in a small speech community: the personal dialects of Moraviantown Delaware. *Anthropological Linguistics* 52(1):1-48. https://doi.org/10.1353/anl.2010.a405139.

81. Sellier, Anne-Laure, Scopelliti, Irene, and Morewedge, Carey K. 2019. Debiasing training improves decision making in the field. *Psychological Science* 30(9):1371-1379. https://doi.org/10.1177/0956797619861429.

82. Goddard, Ives. 1965. The Eastern Algonquian Intrusive Nasal. *International Journal of American Linguistics*, Vol. 31, No. 3.