In this epilogue, I will discuss some of the key issues the respondents addressed in their commentaries and how my thinking about certainty and uncertainty in clinical practice has evolved since I wrote the initial article.

Clinical Practice and Science

There was a time when I fully embraced the parallel between science and clinical practice (Kamhi, 1984), but the more experience I had with clinical practice, the more I began to appreciate how it diverged from the practice of science. I thought that my latest attempt to show why clinical practice is not scientific would seal the deal once and for all. Who could argue with the fact that clinical practice has no built-in mechanism for external verification? The majority of respondents seemed convinced by my argument or chose not to express their disagreement, but I was not hoping to convince the majority of respondents. When I was writing the initial article, one of my target readers was Kenn Apel. Knowing how strongly he feels about the scientific bases of clinical practice (see Apel, 1999; Kamhi, 1999), I wondered if I could get him to modify his views. Nope, couldn’t budge him an inch.

In Apel’s (2011) commentary, he suggests that clinical practice is influenced by several external forces such as insurance agencies and state benchmark assessments. More importantly, he argues that my assertion is based on a general view of science rather than the local view that guides clinical practice. With a local view, internal verification is substituted for external verification. I have no issue with the importance of internal verification (practice-based evidence, or PBE). In my initial article, I advocated combining PBE with traditional models of evidence-based practice (EBP) as Dollaghan (2007) did in her E3 BP model. I also explicitly acknowledged the importance of internal verification in suggesting that concern for patient well-being and the desire to provide the most effective treatment possible may help practitioners balance the certainty and uncertainty that eludes many scientists. But achieving this balance does not make clinical practice scientific.
Unlike Apel (2011), I believe that science is not simply an attitude. I prefer a narrower definition of science that ties it to the use of the scientific method. I think it is important not to gloss over the fundamental differences in the goals, procedures, outcomes, and verification processes of science and clinical practice. Internal verification is no substitute for external verification. The problem of subjective bias is difficult to overcome without an impartial observer (Dollaghan, 2007), which is a rare occurrence in clinical practice. In their commentaries, Clark and Flynn (2011) and Nelson (2011) suggest some ways this bias might be addressed. Many scientists are biased, and their biases may influence how they view and interpret data, but the mistakes that scientists make will eventually be overturned through a lack of external verification. Clinical mistakes, in contrast, have immediate and potential harmful consequences for patients and families.

The desire to reduce clinical mistakes and optimize clinical decision making is what makes many of us so passionate about the need to bring scientific rigor and rational and critical thinking to the clinical process. Apel (2011) wants to encourage scientific thinking, Finn (2011) teaches students to think critically, and I have promoted rational thinking—all of us want some form of EBP. The other contributors to this forum offer interesting suggestions about ways to reduce subjective bias and improve clinical decision making. We may disagree about the best way to improve clinical practice or what to call the reasoning processes that underlie optimal clinical practice, but we are all committed to the same goal.

Teaching Rational and Critical Thinking

Where I agree with Apel (2011) and many of the other contributors (Bernstein Ratner, 2011; Finn, 2011) is that the most important thing we can do as educators is to focus on improving the clinical decision-making abilities of clinicians. Education is the key. There is no easy way to become a rational or critical thinker. Finding a study that supports an intervention does not require critical thinking. Anyone can find a study to support one’s treatment approach. What is difficult is learning to think rationally and critically about clinical practice. Can critical thinking be taught, and if so, what are its key constructs and components?

I did not purposely avoid the question of how to become a rational thinker. I was too focused on uncovering the underlying mechanisms that might allow scientists and clinicians to balance certainty and uncertainty. Fortuitously, Patrick Finn read an earlier version of my article and wanted to be one of the respondents. He has given a lot of thought to the core information involved in critical thinking and how to teach skills like interpretation, evaluation, and reflection. For the last 2 years, he has taught an undergraduate class at the University of Georgia on critical thinking. The course will soon be required for all speech-language pathology majors. A syllabus of the course is available upon request. I strongly suggest purchasing the textbook for the course, * Asking the Right Questions: A Guide to Critical Thinking* (Browne & Keeley, 2007). I have already shared the syllabus with other members of my faculty and have initiated discussions about including critical thinking goals in our graduate research class.

Rational Thinking in Schools

Mary Kristen Clark and Perry Flynn (2011) have some interesting ideas of how to promote rational thinking in school-based settings through the individualized education program (IEP) process. They discuss using the idea of professional learning communities (PLCs) to promote rational, team-based thinking. One of the components of PLCs is shared personal practice that involves team members giving and receiving critical feedback about clinical decisions. Without guidance, most teams tend to use a polite discourse that does not sufficiently explore a particular problem or provide critical feedback (e.g., Little & Horn, 2007). Little and Horn (2007) believe, however, that teams can be taught to reframe problems as uncertainties and then work together to identify the cause of a problem and possible solutions. Clark and Flynn believe that rational, team-based thinking should become the norm for IEP teams. They discuss how this team-based thinking and critical dialogue can be infused in all phases of the IEP process (assessment, planning, implementation, and progress monitoring). I am not optimistic that rational, team-based thinking will ever become the norm for IEP meetings, but it is nice to know that there is a serious group of educators who recognize the importance of team-based thinking and critical dialogue in the IEP process.

Exposure to New Ideas

Another major oversight in my article is that I did not consider the importance of exposure to new ideas. Openness to new ideas has to occur in conjunction with exposure to new ideas. This is the main point of Nan Bernstein Ratner’s (2011) commentary. She discusses how to make information come to us through the use of table of content alerts from various journals and alerts from sources like PubMed and Google. She gets alerts from more than 100 journals, which explains why her articles are always excellent sources for citations from different disciplines. I find the New York Times, CNN, and the Chronicle of Higher Education to be excellent sources of information. I also regularly browse the science and education sections of bookstores. That is how I found Groopman’s (2007) book on how doctors think and Burton’s (2008) book on being certain, which I will talk about later. Of course, it is not enough just to be exposed to new information. This information must be critically evaluated to determine how it will affect existing beliefs and knowledge. This is where critical thinking and rational thought processes are so important because we have a strong tendency to accept new information that is consistent with our existing beliefs and reject information that is not.

EBP and Theory

It seems like I cannot use the word theory without eliciting some reaction. In this case, it was the two words, theoretically agnostic, that sparked Nicki Nelson’s (2011) comment that this term does not describe the clinical process. I could not agree more. The point I was making was that “scientists are not only constrained by the data they obtain, they are also constrained by the theories they test. Practitioners, in contrast, have the option [italics added] of being theoretically agnostic because clinical outcomes are almost always more important than theoretical coherence” (2011, p. 61). Nelson, in contrast, argues that best clinical and educational practices cannot be theoretical; they “must be situated within a systems theory perspective” (2011, p. 83). Yes, theory makes a difference, but my point was that EBP is inherently atheoretical, and this is one of its major limitations. EBP is paradoxically both theoretically agnostic and pluralistic; it can accommodate any theoretical perspective, but
favors none. What EBP favors is the best evidence, but evaluating evidence does not occur in a theoretical vacuum. Clinical practices often reflect theoretical stances that are highly resistant to negative evidence. As a case in point, I doubt there is any evidence that would cause Nelson to change or modify her systems theory perspective.

A common belief is that high-quality empirical evidence will change a person’s theoretical stance and, by extension, their clinical practices, but this is rarely the case. The problem is that the scientific method is not designed to resolve conceptual disagreements (Laughlin, 2005). Laughlin, a physicist, provided the example of how the fight over the theory of superconductivity was one of the longest and bitterest in the history of science because the central issue was conceptual. The theory was eventually accepted for the wrong reasons—factual and methodological ones rather than conceptual ones, which Laughlin believes is common in the history of science. Although conceptual disagreements in physics are clearly not the same as conceptual disagreements in our profession, our conceptual disagreements can be just as long and contentious as those in other disciplines.

To take one example, I am currently a member of the American Speech-Language-Hearing Association’s (ASHA’s) ad-hoc committee on The Role of the SLP in Identifying and Treating Children With Auditory Processing Disorders. We have recently completed a systematic review of the research examining the efficacy of auditory interventions to improve auditory, language, and academic abilities (Fey et al., in press). The results of the review found little evidence that auditory interventions result in better auditory or language outcomes than interventions that do not specifically target auditory abilities. Although the findings of the review were straightforward, reaching consensus about the interpretation of the findings took almost a year, and several committee members remain dissatisfied with the review because their clinical experiences differ from the evidence. I would like to be wrong, but I do not think there is any evidence that could change some of my colleagues’ views on the benefits of auditory interventions.

One can hope that convergent empirical evidence will eventually resolve conceptual disagreements. It is difficult, however, to envision how these disagreements will be resolved given how readily conflicting evidence is dismissed or ignored by those with different conceptual viewpoints. All of this is to say that I agree with Nelson (2011) that theory is important. Indeed, it is often more important and influential than evidence, which means that we remain dissatisfied with the review because their clinical experiences differ from the evidence. I would like to be wrong, but I do not think there is any evidence that could change some of my colleagues’ views on the benefits of auditory interventions.

One reason concerns the nature of knowledge and the basic human propensity to make comparisons. The saying “knowledge knows no bounds or boundaries” captures a basic problem with knowledge; it has no limits. The continuum of knowledge is fixed at one end (no knowledge) but limitless at the other end. The problem is that continuums of knowledge often lack clearly demarcated levels of sufficiency or proficiency. Because experts have so much knowledge in their area of expertise, they have a tendency to overestimate the minimal levels of knowledge competencies required to provide services. Anyone who has ever been involved in developing academic or clinical educational standards knows how difficult this task is.

Our academic standards require that students demonstrate knowledge of principles and methods of prevention, assessment, and intervention of communication disorders and linguistic and cultural correlates of these disorders. This means that no student should be able to get a master’s degree or become certified in speech-language pathology without knowledge of bilingual populations. I do not doubt that every speech-language pathologist (SLP) has some knowledge of bilingual populations, autism, and all of the other required knowledge areas, but knowledge requirements in academic programs are rarely sufficient to become clinically competent in an area. Clinical competence requires the integration of knowledge with the clinical and interpersonal skills involved in assessment, diagnosis, and treatment. The hope is that newly certified professionals have a minimal level of competence to provide clinical services. It is unrealistic to expect that new clinicians will have the clinical expertise of experienced clinicians who specialize in an area. Clinical expertise requires years of experience integrating different types of knowledge with the procedural and problem-solving skills involved in assessment, diagnosis, and treatment.

There is, in fact, now considerable evidence that the only path to expertise is practice (cf. Gladwell, 2008 and Willingham, 2009 for recent reviews of the literature). A common misconception is that the great minds of science were exceptionally brilliant; they were not. What differentiated them was their capacity for sustained work (Willingham, 2009, p. 206). To quote Darwin: “I have always maintained that, excepting fools, men [do] not differ much in intellect, only in zeal and hard work” (cited in Willingham, 2009, p. 134). The same is true for great clinicians: Great clinicians are made not born, and they are made through years of continually striving to improve their clinical skills. In short, knowledge is clearly important for clinical practice, but knowledge is just one pillar in the path to clinical competence and expertise.

The Importance of Knowledge for Clinical Practice

Several of the commentators mentioned the importance of knowledge for clinical practice. With the ever-increasing scope of practice in our profession, it is common for clinicians to have more knowledge and experience in some areas than others. Across the discipline, areas that are particularly vulnerable to knowledge and experience gaps include stuttering, voice, bilingual populations, autism, language learning disabilities, and augmentative communication. I repeatedly remind my graduate students that their academic and clinical strengths are to some extent a function of the faculty at UNC–Greensboro. Few other programs, for example, have a strong clinical program in transgender therapy. It is common, however, for experts to bemoan the limited knowledge that practicing clinicians have in their particular area. Fresh on my mind is a recent conversation with a colleague who expressed concern about the lack of knowledge that practicing clinicians have about bilingual populations. My colleagues in language and reading often express similar complaints about the limited knowledge of practitioners. Why is the limited knowledge of practitioners such a common complaint in clinical and educational professions?

One reason concerns the nature of knowledge and the basic human propensity to make comparisons. The saying “knowledge knows no bounds or boundaries” captures a basic problem with knowledge: it has no limits. The continuum of knowledge is fixed at one end (no knowledge) but limitless at the other end. The problem is that continuums of knowledge often lack clearly demarcated levels of sufficiency or proficiency. Because experts have so much knowledge in their area of expertise, they have a tendency to overestimate the minimal levels of knowledge competencies required to provide services. Anyone who has ever been involved in developing academic or clinical educational standards knows how difficult this task is.

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The Myth of the Autonomous Rational Mind

The central question that motivated my initial article was how practitioners balance the certainty and confidence that they can help their patients with the uncertainty that makes them continually question their beliefs and assumptions. The search for the answer to this question led me to consider how scientists and clinicians are able to achieve the right balance between acceptance of the status
So much for my conclusion about rational thought processes. Scientists, it turns out, are not too good at achieving the right balance, but they have a safety net of a community of scientists who ensure that empirical evidence and external verification will eventually triumph over individual beliefs and assumptions. Clinicians do not have science’s safety net, but their concern for patient well-being and internal verification (Apel, 2011; Dollaghan, 2007) may help them continually question their beliefs and assumptions. It took me more than a year to reach the conclusion that a clinician’s propensity for rational thinking (Stanovich, 2009) may be the most important factor in achieving the right balance between certainty and uncertainty. It took less than a month for me to have serious doubts about whether I was right.

Shortly after I submitted my article, I was browsing the science section in a large big-chain bookstore and noticed a small paperback book with the intriguing title, On Being Certain: Believing You Are Right Even When You’re Not. The book was written by a physician, Robert Burton (2008), who is the associate chief of the Department of Neurosciences at the University of California at San Francisco. On the third page of the preface, he effectively smashed my conclusion. “Are certainty and conviction purely deliberate, logical, and conscious choices, or not what they appear?” he rhetorically asks. The answer is “startling and counterintuitive.” The “revolutionary premise” of his book is:

Despite how certainty feels, it is neither a conscious choice nor even a thought process. Certainty and similar states of “knowing what we know” arise out of involuntary brain mechanisms that, like love or anger, function independently of reason. (Burton, 2008, p. xiii)

So much for my conclusion about rational thought processes. Because I like to view myself as someone who is open to new ideas, I bought the book rather than pretend I never saw it.

Burton’s (2008) main argument is that the feeling of “knowing” is a bodily sensation rather than the product of a rational thought process. The following anecdote captures the essence of his argument: At a book club he occasionally attended with other University of California professors, novels were rarely chosen because the club wanted their discussions to be based on evidence rather than feelings. The books read were typically about politics, history, or science. Despite the presumed focus on evidence, discussions often became polarized, which led to frustrated comments like, “Why can’t you, just once be reasonable?” or “If you would only be objective.”

Burton (2008) goes on to point out that the misconception that underlies comments like these is that every rational person should reach the same conclusion when given the same information. Reason, in this view, operates like the laws of physics, but this is not the way reason operates. Reason is not disembodied, like a brain in a jar; it arises from the nature of our brains, bodies, and bodily sensations and experiences (Lakoff & Johnson, 1999, p. 4). The brain contains no isolated circuitry that can engage itself in thought, free from involuntary and undetectable influences. Without this ability, certainty is not a biologically justifiable state of mind (Burton, 2008, p. 141). Contrary to what we would all like to believe, it is not possible to interpret information without being influenced by prior beliefs, assumptions, and personal feelings.

Gary Marcus (2008) reached the same conclusion in his recent book about kluges—clumsy and inelegant, yet often effective, solutions to a problem: “Instead of an objective machine for discovering Truth with a capital T, our human capacity for belief is haphazard, scarred by evolution and contaminated by emotions, moods, desires, goals, and simple self-interest—and surprisingly vulnerable to the idiosyncrasies of memory” (p. 41). In his chapter on belief, Marcus provides many examples of how susceptible humans are to confirmation bias. No matter what we think about, we pay more attention to things that fit with our beliefs than things that might challenge them.

The belief that we can strip our ideas of biases and objectively judge them affects scientists as well as nonscientists. Burton refers to this deeply engrained belief as the myth of the autonomous rational mind (2008, p. 142). Burton obviously places great value on introspection and has tried to be particularly mindful of his own biases, especially when making medical recommendations. But what began as a personal journal based on self-reflection ended up as a book on the limits of self-knowledge. Until writing this book, Burton had always wondered why some bright, well-trained doctors would perform unnecessary surgeries or recommend unproven treatments. His first inclination was to think that these doctors were greedy, indifferent, arrogant, or ignorant, but now he believes that these inappropriate medical practices were caused by the faulty belief that we can know with certainty that something is correct. This is essentially the same problem I set out to address in the initial article: how bright, well-trained clinicians could be so certain that their clinical practices are better than any alternative course of action. The feeling of certainty that comes from years of clinical experience creates a powerful resistance to any viewpoint or empirical evidence that challenges one’s clinical practices. Unfortunately, the certainty that arises from clinical experiences typically is not based on evidence linking treatment procedures and outcomes, nor are these experiences and personal observations verified by independent evaluators.

What Now?

It is very difficult to accept the notion that reason and evidence may not prevail over one’s desires, goals, feelings, and self-interest. As scientists and educators, we not only embrace the idea of the autonomous rational mind, we also take great pride in our rational thinking dispositions and our ability to teach our students how to reason. The value we place on rational thinking has no doubt led many of us to select a profession that requires these thought processes. This is one reason for the appeal of Stanovich’s (2009) view of rational thinking dispositions. The thinking dispositions associated with rational thought, such as seeking various points of view before coming to a conclusion, are clearly desirable. But rational thinking does not guarantee that people will reach the same conclusions about how best to solve particular problems. Burton (2008) suggests that the best one can hope for is partial objectivity, which would involve recognizing our preferences and biases and then subjecting them to especially harsh scrutiny. I think we can hope for more.

As health care providers, we need to recognize that every SLP who adheres to the profession’s code of ethics “to hold paramount the welfare of persons they serve professionally” (ASHA, 2010, p. 1). What this means is that despite the different theoretical perspectives we may embrace, the different goals we may target, the different treatment approaches we may use, or the different ways we may interact with clients, we all believe that our clinical practices are serving the needs of our clients. Perhaps diversity and differences in clinical practices should be viewed the same way we view diversity in groups of people. Maybe we should be more accepting of different clinical perspectives and seek to understand the reasons for different clinical decisions instead of simply dismissing them as misguided.
Clinical practices can often be traced to the personal and professional history of practitioners—where they went to school, who their mentors were, where they have worked, and so on. Understanding the roots of our fellow clinicians’ different perspectives may make us less likely to reflexively characterize them in negative ways. And we may be able to use this information to convince them that our perspective is better. The usual hand-waving argument that our approach is the most effective, evidence based, and theoretically sound usually does not convince skeptics to adopt our views.

My views, for example, about the benefits of auditory interventions (Kamhi, 2004, in press), nonspeech-oral motor exercises (Kamhi, 2008), and general reading comprehension strategies (Kamhi, 2009) are well known. Evidence and reason have led me to conclude that these are not the best way to improve children’s listening and speech production abilities or their reading comprehension. Many colleagues and clinicians disagree with me, and they are just as certain about the correctness of their views as I am about mine. The reasons for the disagreement may be based on evidence, theory, clinical practice, or feelings, but the reasons for the disagreement do not really matter. What matters is that evidence and rational thinking have not led to the same conclusions. This is because certainty and uncertainty are not simply the product of rational thought processes; they are the product of feelings, emotions, desires, goals, self-interest, and personal and professional histories.

The only way to ensure that we make optimal clinical decisions is to subject these decisions to independent verification. Two of the commentators (Clark & Flynn, 2011; Nelson, 2011) offered some specific suggestions about possible mechanisms for external verification in clinical practice. Since writing the initial article, I have come across some promising models of evidence-based care that include mechanisms for self-correction. At the most recent ASHA convention, for example, Gordan and colleagues discussed their Spinal Cord Injury Rehabilitation project (SCI Rehab), a six center research effort designed to determine which spinal cord injury interventions are most strongly associated with positive outcomes at 1 year post-injury (Gordan et al., 2009). A particularly promising model of quality care has been developed by Dr. Brent James at Intermountain Healthcare, a network of 23 hospitals and clinics in Utah and Idaho. The story of how Dr. James improved the quality of care at Intermountain over the last 20 years was the feature article in the November 8, 2009 New York Times Magazine section. The success of Intermountain makes the story worth retelling in some detail to show what is possible with a visionary leader who is committed to evidence-based care.

Intermountain Healthcare

Dr. James began working at Intermountain approximately 20 years ago with a clear vision of what he wished to accomplish: Whenever physicians or nurses said “in my experience” when talking to a patient, they should mean, “In my measured experience” (p. 7). James knew that he could not simply show physicians data and expect them to change their clinical practices. He needed to set up a process that led to change. The process he set up at Intermountain begins with the identification of a problem. For example, there was a problem in setting the ventilators to treat acute respiratory syndrome (ARS). There was too much variability in the setting doctors used, and doctors would often set ventilators at different levels for similar patients.

The second step in the process is the development of a treatment protocol by a committee of doctors, nurses, and administrators from Intermountain’s network of 23 hospitals and clinics in Utah and Idaho. The committees meet monthly to modify the protocols, set clinical goals, and track physician treatment and patient outcomes. Committees grapple with balancing Intermountain’s internal, practice-based evidence with larger scale published studies. The protocols often lead to dramatic improvement in outcomes. The survival rate of patients with ARS improved to 40% in the year after the initial protocol was developed; the national survival rate of patients with ARS was only 10% at the time. Intermountain now has protocols for 50 clinical conditions.

The final step in the process involves sharing treatment data with patients to allow them to be involved in the decision-making process. This often results in patients opting for less aggressive care because the outcomes are similar to the more aggressive care. Not surprisingly, patient satisfaction is significantly higher with the less aggressive care.

The quality care process that Dr. James set up at Intermountain provides a model for other health care centers, clinics, and facilities (e.g., schools) that provide services. There are four key components that contribute to the success of the Intermountain model of evidence-based care: (a) a strong administrator, (b) treatment protocols, (c) an internal database of treatment and patient outcomes (i.e., PBE), and (d) an independent evaluation mechanism (e.g., a committee that meets regularly to evaluate physician treatment and outcomes). The essential component in the process are the committees, which function as a self-correction mechanism by independently evaluating physician care with treatment outcomes. Doctors may disagree with the protocols, but they cannot dispute data showing how their treatment compares with treatment provided by other physicians. The benefits of protocols have received widespread popular attention with the publication of Atul Gawande’s latest best-selling book, The Checklist Manifesto (2009). The major premise of the book is that no matter how expert one is, a well-designed checklist (i.e., protocol) can improve outcomes.

Final Thoughts

I began this clinical forum with the question of how practitioners can balance the certainty that they can help patients with the uncertainty that makes them continually question their beliefs and assumptions and be open to new ideas and clinical practices. The quest for the answer to this question led to a comparison of science and clinical practice and the claim that clinical practice lacks the self-correction mechanism of science that flushes out mistakes. Clinical practice, I argued, has no intrinsic mechanism for independent evaluation and verification. Models of EBP and clinical expertise offer the promise to improve clinical practice but often fall short because they have proven difficult to implement (Tonelli, 2006). I concluded the initial article with the idea that rational thinking is the key to optimal clinical practices.

The commentators took different tacks in responding to the initial article. Apel (2011) and Clark & Flynn (2011) suggested mechanisms of clinical practice that could provide verification for clinical practices. Finn (2011) focused on the importance of rational (critical) thinking and how to better educate our students to be critical thinkers. Bernstein Ratner (2011) discussed how openness to new ideas is closely linked to exposure to new ideas. Nelson
(2011) addressed the importance of theory for clinical practice, and several commentators raised concerns about the impact that limited knowledge has on clinical practice. My views about the role of rational thinking have changed since I wrote the initial article. As I discussed in the previous sections, I now recognize that like many others, I have fallen prey to the myth of the autonomous rational mind. As Burton (2008) and Marcus (2008) have shown, our beliefs are influenced by our feelings, emotions, desires, goals, and simple self-interest and are vulnerable to the idiosyncrasies of memory. This explains why highly rational thinkers will often reach different conclusions about the same set of observations.

The only way to ensure scientific or clinical progress is to embrace a system that has a built-in mechanism for independent evaluation. This is how the quality of care was significantly improved at Intermountain Healthcare. The quality care system at Intermountain was not easy to set up. It took the vision, commitment, and tenacity of someone like Dr. James to implement. There are many obstacles to duplicate the success of Intermountain in nonhospital settings (e.g., schools and clinics) where many SLPs work, but these obstacles are not insurmountable. My colleagues who contributed to this clinical forum and many other SLPs are continually searching for ways to improve our clinical practices. These efforts need to include exposure and openness to novel ideas and a mechanism for independent evaluation of clinical practices.

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