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The Challenge of framing a Problem: What Is Your Burning Question?

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My mantra, framed on the office wall, asks, “What is your burning question?” It is what one first encounters when they enter into my scientific inner sanctum. Reactions vary from anxiety to lack of comprehension. Yet we need to deal with this issue, to guide investigators to know what constitutes a burning question of genuine interest. Having identified such a question, we can guide others, as well as ourselves, along the pathway that will challenge us to frame a problem thoughtfully. In turn, this should produce a rewarding answer. This is our mandate. In the role of research mentors, we can help students to move beyond the deer in the scientific headlights syndrome, to find their own burning question and approach it with intellectual passion, creativity, and sensibility.

I asked my first burning question at 6 years of age. I was a pupil at the University of Iowa Child Laboratory School, and our teacher had introduced a project in which a live hen, a first-time mother, would hatch eggs and raise chicks. I was intrigued, especially when the teacher told us with great scientific authority that it would take exactly 21 days for the chicks to hatch. I religiously checked off the days on our home calendar, with my mother's help, and Day 21 fell on a Saturday. My mother had to work that day, and so on my own, unbeknownst to my mother, I trudged up to the school and peered through the slats of the outdoor wooden cage to observe what might have happened. Surprisingly, there were no other children from our class, nor was the teacher on-site for this great event. I was the lone observer. Sure enough, one by one, little chicks pecked their way out of their protective shells, to be greeted by their somewhat incredulous but welcoming mother hen.

Three years later, the saga continued with chickens yet again dominating my curiosity. Long before I knew about science officially, I had a fourth-grade pseudo-science course in which the teacher talked about something called “instinct.” Animals come into the world knowing how to engage in certain behaviors without having to be taught. That was how I interpreted the message. I was a bit skeptical; I had to prove this for myself. So when our small multicolored banty hen, which I had named “Speckle” (male partner named “Heckle”), laid two eggs in our barn loft, I was excited. But there was yet no new experiment. (I had already documented the 21-day claim.) Unfortunately, her eggs were eaten, probably by barn rodents, and both she and I were distressed. We also had large white ducks of both genders. (On a farm, you learn Fertility 101 at a fairly early age.) So here was experiment Part A: I put a duck egg under her in the nest. Could she now hold out for 21 days? Was it the same time period for duck eggs? Part B: If the duck hatched, could it instinctively swim from birth? Part C: Would the mother adopt the duckling as her own? Would the duckling accept a chicken as a mother (what I much later learned, in my psychology courses, was termed “imprinting”)? These were my burning questions, and I found answers to all of them. The duck, named “Yankee Doodle” because he was born on the Fourth of July, hatched appropriately, immediately paddled around in a vat of water I had waiting, and followed his small banty hen mother around for months. It was at first very poignant and then amusing as he grew to three times her size. Moreover, his trips to the pond caused his mother great consternation!

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The Sources of Scientific Ideas

My childhood experiences have served me well in terms of thinking about the challenge of framing a research problem. Where do we turn, as adult scientists, to find a problem worthy of study? One can appreciate that in the history of ideas, there is no one source. Is this a comfort or a cause for confusion? Where should we cast our gaze? Where can our efforts at finding a burning question make a difference in terms of advancing the science of our given discipline?

There are many paths to framing a question. Yet the path we choose needs to be thoughtful, insightful,

innovative, and groundbreaking to move the field forward. I have written elsewhere about not putting the methodological cart before the conceptual horse (Harter, 1999). Merely taking an existing measure or comparing two measures, without a burning question, is unlikely to generate very meaningful findings. Repeatedly administering the same measure(s) to the same or different populations, or being monoga-mously wedded to one's pet paradigm, is not likely to result in a scientific discovery. One needs compelling and interesting hypotheses that often require different frameworks, paradigms, and methodologies.

The sources of ideas are many as we look at the history of our discipline, and no one source is necessarily any more worthy than another (although textbooks and certain professors might tell a different story). Where do good ideas come from? Where should we focus? One can revisit historical theories that the field has deemed obsolete, thoughtfully examining whether there may be kernels of truth that can be revived. Freudian theory, Piagetian theory, Jamesian theory, and other historical perspectives have not garnered approval during recent decades. Yet there may be remnants of these grand theories that are worth exploring. There may be lingering questions and legitimate challenges that are still well worth investigating. To reject an entire theory, a popular stance among some contemporary investigators, is to diminish the importance of the very source of ideas that has spurred our fields forward. A healthy respect for our intellectual elders can only enrich our understanding of the processes that they identified years ago.

In addressing the issue of how we frame a problem, I take the reader on a journey through the history of my own work on the self-system over some 40 years, citing examples to document more general strategies for identifying important problems. In so doing, I hope to make this as concrete as the process has been for me. My goal is to identify different sources that allow one to recognize a burning question and to frame a problem. Although the examples are from our own research, I hope to transcend the particular content of this body of work and extract some guiding principles that reflect legitimate avenues of exploration rather than mere textbook formulas. I would submit that the creative geniuses in our field did not adhere to formulas.

Grand Theories in Psychology: What Do We Retain, What Do We Distain?

We have a rich repository of theory in our field, much of it generated by theoretical giants who were considered deities during my graduate school days. In our courses, in our comprehensive exams, and in our research, we bowed to Freud, Erikson, Piaget, Skinner, and James at the urging of our knowledgeable professors. Their theories were the beacons that were to guide us through the process of formulating a problem that we could research with conviction. However, as the field “matured,” attitudes changed and many felt that these formulations were far too vague in their conceptualization. As such, they did not lend themselves to researchable formulations. Consequently, these theories have fallen from grace, considered by some to be mere grand frames of reference of interest primarily for historical reasons. One needs to appreciate the reasons why such a shift in thinking has occurred. I was personally interested in comprehending why interest in the self, in particular, has waxed and waned. In examining these historical causes, I conclude that our predecessors may have had some insights that are well worth recovering and preserving.

I now give examples from my own work on the self and how, despite the negligence of interest in historical scholars of the self (notably William James and Charles Horton Cooley), there has been a resurgence in these historical frameworks that has reenergized our thinking about the self. More important, given the theme of this volume, their wisdom and insights have been transformed into researchable formulations, in the hands of thoughtful researchers, rather than relegated to the realm of mere arcane philosophical speculation. What follows is a brief discussion of these historical trends with regard to the self.

During the early period of introspection (at the turn of the 20th century), inquiry into topics concerning the self and psyche flourished. However, with the emergence of radical behaviorism, such constructs were excised from the scientific vocabularies of many theorists, and thus the writings of James (1892) and of symbolic interactionists such as Cooley (1902) gathered dust on the shelf. Constructs such as self, self-esteem, ego strength, narcissistic injury, sense of omnipotence, perceived incompetence, unconscious sense of rejection, and so on did little to whet the behaviorists' appetite. It is of interest to ask why the self was no longer a welcome guest at the behaviorists' table. Several related reasons appear to be responsible.

The very origins of the behaviorist movement rested on the identification of observables. Thus, hypothetical constructs were both conceptually and methodologically unpalatable. Cognitions, in general, and self-representations, in particular, were deemed inappropriate because they could not be operationalized as observable behaviors. Self-report measures designed to tap self-constructs were not included on the methodological menu because people were assumed to be inaccurate judges of their own behavior. Finally, constructs assessed through introspective and self-report measures were not satisfying to the behaviorists' palate because their functions were not clearly specified. The very cornerstone of behaviorism rested on a functional analysis of behavior. In contrast, approaches to the self did little more than implicate self-representations as correlates of behavior, affording them little explanatory power as causes or mediators of actual behavior.

Several shifts in emphasis, beginning in the second half of the 20th century, have allowed self-constructs to become more palatable. Hypothetical constructs, in general, gained favor as parsimonious predictors of behavior, often far more economical in theoretical models than a multitude of discrete observables. In addition, we witnessed a cognitive revolution within the fields of both child psychology and adult psychology. For developmentalists, Piagetian and neo-Piagetian models came to the forefront. Among experimental and social psychologists, numerous cognitive models found favor. With the emergence of this revolution, scholars reclaimed the self as a cognitive construction, as mental representations that constitute a theory of the self (Harter, 1999). Finally, self-representations gained increased legitimacy as behaviorally oriented clinicians were forced to acknowledge that the self-evaluative statements of their clients seemed powerfully implicated in their pathology.

It was now permissible to take James's dusty volumes down from the shelf and take a closer look at the insights of this brilliant scholar of the self for clues on how to understand puzzling findings in our own research. By the 1980s, the field had moved to multidimensional models of self-evaluation that included domain-specific self-concepts (e.g., scholastic competence, athletic competence, physical appearance, conduct, social appeal), as well as global self-esteem, that reflected one's overall worth as a person independent of domain-specific evaluations of one's competence or adequacy (Harter, 1999). Designing measures to assess self-evaluations so defined was based on the premise that merely aggregating perceptions of domain-specific perceived competence and adequacy was not the route to understanding self-perceptions. Such an approach, used in measures designed during the 1960s, masked the differing self-evaluations that one held across different domains and ignored the many diverse profiles that exist across individuals. In addition, summing such scores did not yield a meaningful overall index of one's worth as a person. As more complex models of the self-system emerged, new measurement strategies were required to tap its multidimensional characteristics. Therefore, it is now common for self-esteem instruments (Bracken, 1992; Harter, 1982,1999; Marsh, 1991) to tap domain-specific self-concepts, as well as global self-esteem, separately.

How could James's century-old theory help us to understand some puzzling findings that emerged in our own data? Using a multidimensional approach, what became clear in looking at dozens of individual protocols was that there were children who had virtually identical profiles across the five specific domains, with some scores high and some scores low across comparable domains. However, such children could have very disparate global self-esteem scores (for examples, see Harter, 1999). One child would have very high self-esteem, whereas another child would have very low self-esteem. How was this to be explained—two children who looked virtually identical in their pattern of domain-specific scores but who looked entirely different on their scores tapping their overall sense of worth as persons?

James (1890, 1892) scooped us all in arguing that our global self-esteem is not merely the sum of our perceptions of competence or adequacy in the self-evaluative domains of our lives. Rather, he cogently reasoned that global self-esteem is derived from our self-evaluations in domains that are deemed important to the self, where we have aspirations or “pretensions” to be successful, to employ James's own language of the day. From this perspective, the individual who perceives the self to be successful in domains of importance, and who can discount the importance of domains in which he or she is not that successful, will have high self-esteem. In contrast, individuals who continue to tout the importance of domains in which they are not successful will suffer psychologically in the form of low self-esteem. Thus, the importance of success was the missing link in explaining the puzzling individual profiles of children. James's insights required both a conceptual shift in our thinking, based on his innovations, and methodological innovations in the form of

the actual assessment of the importance of success. More than two decades of research (Harter, 1999) have revealed that during later childhood, adolescence, and adulthood, a consideration of the importance of success in conjunction with one's self-evaluations, namely, discrepancy, is a major predictor of one's global self-esteem. From this perspective, one need not be a superstar in all of the domains that society deems important. Rather, one needs to highlight the domains in which one is successful and discount those where one has limitations.

What are the general lessons to be learned here? The first is not to relegate century-old theories to the delete file. True wisdom survives the ages if we muster the respect to seek it out. Second, we should not rush, in our data-analytic strategies, to the newest statistical package that promises elegant analyses of findings for groups of participants. This may be an ultimate goal, yet we need to examine individual protocols, puzzle over them, and thoughtfully look for patterns that may define subgroups and patterns that may defy any initial interpretation. It was in the wonderment of seemingly inexplicable profiles for individuals that we ultimately made progress. To sweep such findings under the conceptual rug and not be challenged by them will slow our scientific progress and will not allow us to grow intellectually. James, therefore, remains alive and well in our scientific consciousness and has provided numerous clues that have advanced our contemporary understanding of self-processes.

Thinking Outside of the Theoretical Box

What burning question follows from this understanding of self-esteem? How can we build on James's insights about the self-system? What challenges are there to framing new and related problems of study? Society has been crazed about self-esteem during recent years. Schools clamor to find the magic bullet, we are besieged with self-help books, and we are assaulted by the media and parenting magazines promoting the message that we need to attend to our own self-esteem as well as the self-esteem of our children. Yet why should we be so obsessed with self-esteem if it may have no important ramifications in our lives? Merely discovering the causes of self-esteem does not deal with an equally important question: What are the consequences of high or low self-esteem? This becomes the next burning question on the journey to build a bigger and better model. After years of studying the determinants of self-esteem, I bolted out of my office chair one day and inarticulately asked myself, “What if self-esteem doesn't do anything?” Seligman (1993) put it a bit more eloquently, suggesting that self-esteem might merely be an epi-phenomenon; that is, we know its causes, but it does not seriously influence or mediate behaviors of importance or interest.

This is a critical question, to be sure. However, considerable evidence in the developmental, clinical, and social psychological literature reveals many correlates and consequences of self-esteem for children, adolescents, and adults. Here, consultation with those in somewhat different fields may be very helpful. In my own case, I was fortunate to meet a clinician, Donna Marold, who had considerable experience with adolescents with low self-esteem. She instantly identified depression and potential suicide as a powerful correlate of low self-esteem. Eventually, the research community resonated to such insights, and the emerging literature now reveals that there is a strong statistical link (r values across studies range from .45 to .80) between level of self-esteem and self-reported depressed affect (for a review, see Harter, 1999). Both self-reported and diagnostic assessments of depression are also predictive of suicidal ideation and behavior.

Our own model (Harter, 1999; Harter, Marold, & Whitesell, 1992) clearly demonstrates these effects. Depression and suicidal behaviors represent serious mental health threats, indicating that we need to keep pushing our models, formulating new questions that will lead to more effective prevention and intervention efforts. We also need to consult with colleagues in different but related disciplines as consultants who can help us to sharpen our focus and formulate new problems to be addressed. Moreover, such consultants can turn into valuable collaborators, whereby two or more heads are better than one and the product reflects the greater complexity of the phenomenon. As a general reflection, early in my career it seemed that the values of academic research reflected those of our society, emphasizing autonomy, independence, and rewards for “my own idea, my theory.” Fortunately, this solipsis-tic approach to research has given way to far more collaborative efforts. Universities are rewarding collaboration across fields, and (at an even broader level) large consortia across universities and research establishments are flourishing. Even Nobel prizes are awarded to research teams. Thus, one need not try to frame one's research problem, one's burning question, in a personal intellectual vacuum. One can seek out feedback, network, look to reasonable consultants, and

collaborate. There will be many benefits.

Another Unheralded Historical Scholar of the Self: Charles Horton Cooley

In our search for an understanding of the causes of self-esteem, we also discovered the formulations of Cooley (1902), who put forth a very different model of the causes of self-esteem. For Cooley, the self was very much a social construction, built on the incorporation of the attitudes of others toward the self. Cooley made reference to the “looking glass self,” by which he meant that the significant others in our lives were social mirrors into which we gaze, to divine what others think of us as people, whether we are worthy of respect or esteem. Our judgments or perceptions of their reactions will directly translate into our view of our own self-esteem, how worthy we are. We eventually will come to own these opinions of others as personal beliefs about our selves.

Is this arcane theory to be debunked? We thought not, yet Cooley was a philosophical scholar and not an empiricist. Thus, two questions arise. First, is Cooley's theory worthy of revival at the level of empirical investigation? Second, does Cooley's theory compete with James's theory? Should we frame this as who is right and who is wrong? In my opinion, my training and others' training historically has been misguided in that researchers, be they students or faculty, had been led to believe that formulating a good research question was to pit one theory against another. I have labeled this the “alpha male” model of research, although some women have adopted it as well. Yet we need to abandon this mentality. In the case of our own research, we have simultaneously investigated both James's and Cooley's formulations with the same participants, finding that each theory accounts for the prediction of self-esteem about equally (Harter, 1999). We have described an additive model documenting that if one feels competent in domains of importance (James) and has approval from others (Cooley), then such an individual will have the highest self-esteem. Conversely, one who has both low perceptions of competence in domains of importance and low approval from significant others will have the lowest self-esteem. The general point is not to pit one theory against another but rather to allow different perspectives to contribute to an understanding of the processes one is trying to investigate. That is, in exploring a given topic, such as the causes of self-esteem in our own research, more than one theory can contribute to an account of the phenomenon; they need not compete. They can, in statistical terms, each contribute to the variance in our understanding the problem.

From Theory, to Reality, and Back Again

In the winter of 1999, I was intrigued by the continuing media account of the then nine high-profile cases of school shooters. Culling the reports across these cases, there were several commonalities. First, they all were white males, in late childhood or adolescence, from small cities or rural and suburban areas around the country. Second, many of the features in their childhoods and adolescence years were quite consistent with the predictors of low self-esteem, depression, and suicidal ideation in the model we were developing. Might this be a springboard for formulating a somewhat different challenging research problem? Too often, our research vision is occluded by the dictates of the “ivory tower” and we do not look to natural, or what are actually unnatural, occurrences in our world. We often regard the real world as a separate sphere; attention to such problems may disrupt our concentration on the somewhat limited research program that we have been singularly pursuing. Yet such real-world events provide a wake-up call. What is really going on in our society? Perhaps these questions are more important than our carefully crafted 2×2 experimental designs that can be tested only within the confines of a laboratory.

I was personally pondering whether we should extend our model even further into predictors of not only suicidal ideation but also violent ideation. The clinical literature reveals that internalizing symptoms (including suicidal thinking) and externalizing symptoms (e.g., acting out, aggression, homicide) are so highly related that it is often difficult to know whether adolescents will act out against others or themselves. On April 20, 1999, I was working at home, thinking about how we could extend our model even further, when the cable news channel CNN played out the entire tragedy occurring at Columbine High School. Columbine is 15 minutes from our house. Our daughter, at college, called me because she had learned that it was a high school in our county, although they had not yet disclosed the name. She was concerned that it might have been her nearby high school. It was not. However, she knew high school students from Columbine because

she was active in competitive high school sports and had met girls there through that avenue. So this tragedy was now literally in our backyard.

Why bring this up in an essay on the challenge of framing a research problem? I bring this up because such events represent the psychological reality in which we live. We must be aware of the issues that are real, are pressing, and need to be investigated, issues that can be the sources of critical research questions. I recently heard a statistic indicating that only about 15% of our population in America either reads informative newspapers, particularly the newsworthy sections, or watches television news. Sadly, students are highly represented in this group. Are they watching television? Of course. However, are they watching television that might help them to formulate interesting research questions?

Columbine has become, unfortunately, the metaphor for the white male adolescent school shootings. There have now been 11 high-profile cases. In our own research, we chose to use this very tragic event to further our understanding of such violence in the school system. What might be our burning questions? Several. To what extent do the predictors in our model of low self-esteem, depression, and suicidal ideation map onto the lives of violent ideators in a normative group of adolescents? What might we learn from reading media accounts about factors that no one has ever seriously considered? Here, I was astounded, particularly as someone who has studied emotions, including shame and guilt, for some years. The media accounts clearly indicated that in all of these cases, the actual school shooters had been humiliated, repeatedly and chronically, and it was usually a humiliating event that precipitated their revenge. Yet we literally have no literature on humiliation. We have studies on how being a victim of aggression can eventually lead to acting out against perpetrators. But we have not attended to the emotional mediator of humiliation.

In our own research, therefore, we are studying links between suicidal ideation and homicidal ideation, including the precursors and the role of humiliation (Harter, Low, & Whitesell, 2003). The more general point is that we need to attend to current events and to be alert to clues as to dynamics that even your wisest professors or mentors (including me) have missed—in our case, the role of humiliation. I had a graduate school applicant ask me recently, “What is your program of research for the next 5 years?” This was a legitimate question, to be sure. But my response was that “I have no idea” because issues such as the school shootings, 9/11, and current concerns about terrorism loom large on our societal front, and many of these are grist for the mill in terms of what we should be studying. They become the new research problems that we need to frame thoughtfully.

When One Model Does Not Fit All

It is gratifying to develop models, piece by piece, and eventually to employ statistical techniques that validate the relationships one has articulated. In our case (Harter, 1999; Harter et al., 2003), we have now determined that competence or adequacy in domains deemed important to an individual, plus related approval from parents and peers, strongly predicts a composite of global self-esteem, affect (depressed to cheerful), and hope (hopeless to hopeful). This constellation, in turn, predicts both suicidal ideation and violent ideation. Group data from normative samples of adolescents have convincingly documented such a model. Yet is this the end of the theoretical and empirical journey? Have we answered all of our burning questions? Not necessarily.

For those of us who are interested in individual children or adolescents as clinicians, school psychologists, counselors, teachers, and parents, our ultimate goal is to understand individuals who may profit from interventions if they are suffering from low self-esteem, depression, and either suicidal ideation or violent ideation (or both). Our own research (Harter, 1999; Harter & Whitesell, 1996) has revealed that not all predictors in the model are relevant in the lives of troubled adolescents who suffer from these self-reported symptoms. That is, there are multiple pathways to the experience of low self-esteem, depression, and either suicidal or violent ideation (or both). Pursuing this theme, we next identified six different pathways that were common enough to identify most adolescents. For example, some experienced negative self-evaluations in the domains of physical appearance, peer likeability, and athletic competence that led to self-reported lack of peer approval and that, in turn, led to feelings of low self-esteem, depressed affect, and hopelessness about the future. For others, perceived lack of scholastic competence and perceptions of negative conduct led to lack of parental approval that, in turn, represented the pathways to low self-esteem, depressed affect, and

hopelessness. These are but two examples. The general point is that those whose profession is to intervene in the lives of children and adolescents cannot be content with applying general models of symptoms despite their statistical significance with large numbers of participants. We need to take the next logical step in reframing the problem or question as follows: Which pathways are relevant for a given individual?

Issues of Directionality: Constructing and Deconstructing Our Models

The paper on our general model of the predictors, correlates, and consequences of low self-esteem and depression was accepted by a well-respected journal, and it makes for a good colloquium talk or class lecture and generates interest, particularly when applied to real children and adolescents, including the point that there are multiple pathways. Yet the simmering coals are not yet cold; we need to add more conceptual fuel to the fire. Statistical tests, even sophisticated path-analytical techniques, conducted with data collected at one time period do not truly address the issue of the directionality of effects. Often, we design our models to meet the prevailing theories of the day. For example, during the 1970s, the most popular models suggested that cognitions drive emotions. We fell prey to this conceptualization, reasoning that a negative cognition about the self, namely, low global self-esteem, would lead to depressed affect, an emotion. However, when any two variables are as highly correlated as these two (correlations ranging from .65 to .80 in our own data), one must question their directionality. That is, reversing the directionality of the statistical paths or arrows, suggesting that depression might precede feelings of low self-esteem, would lead to an equally good fit for the model. Statistical techniques cannot solve this dilemma. Thus, we have a new challenge in terms of framing another problem. How does one determine the directionality of effects, and does it even matter?

I teamed up with an experienced and thoughtful clinician, Donna Marold, and we took the bold step of actually talking to adolescents. We put our questionnaires aside and simply asked those who were low in self-esteem, coupled with depressed affect, “Which comes first? Do you first not like yourself as a person and then feel depressed, or do you first feel depressed and then not like yourself as a person?” (Harter & Marold, 1993). The findings revealed two groups of adolescents: one subgroup whose members first experienced low self-esteem that, in turn, was followed by depression and a second subgroup whose members first felt depression that, in turn, made them not like themselves. The explanations they provided were quite convincing (Harter, 1999; Harter & Marold, 1993). Those who first felt low self-esteem gave examples of their own personal inadequacy that led them to feel depressed. Those who first experienced depressed affect reported causes in the form of actions of others against their selves (e.g., rejection, harm, loss). Thus, if we are interested in the experiences of individual children and adolescents, we need to continually reframe the problem and determine the directionality of effects from the individual's perspective if we are to be effective diagnosticians and healers.

Similar questions about directionality arise when one examines both James's and Cooley's positions. James argued that perceptions of adequacy in domains that were deemed important would lead to global evaluations of worth. Cooley contended that approval from significant others would be internalized in the form of global self-esteem or worth. Yet these were scholars of adult behavior. How might the directionality be affected at different developmental levels? Moreover, does it make a difference in the individual's life? We have determined (Harter, 1999) that one domain, perceived physical appearance, correlates most highly with global self-esteem if this domain is deemed important. Does this mean that one's evaluation of one's looks determines global self-esteem? Might global self-esteem influence one's perceptions of one's appearance? What might the directionality of this relationship be? Our statistical modeling once again could not answer this question.

Thus, we needed to find another avenue. Once again, we asked adolescents, “Which comes first?” We determined that approximately 70% of the adolescents indicated that they were basing their overall sense of worth on their perceptions of their appearance, whereas the remainder indicated that the directionality was the opposite. For the latter group, perceptions of their self-esteem determined how much they liked the way they looked. However, do these two orientations have any other interesting implications, and are there more questions to be asked? The answer is yes, there are more questions to be asked, because we found that for females, in particular, the orientation in which appearance is the basis for one's global self-esteem, whereby perceptions of one's outer physical self drives one's evaluation of one's inner self, is the more pernicious one. Females who endorse this model report that they are less attractive, have lower self-esteem, and are more

depressed (Harter, 1999).

Obsessed with the concept of directionality, we asked the same question with regard to Cooley's formulation that the opinions of others are incorporated into one's global sense of self. Such a conceptualization is reasonable if one considers childhood, and Cooley (1902) acknowledged this point in talking about the growing period of youth. Might it not be the case, however, that during adolescence and beyond the directionality might be reversed, such that one would have a metatheory that if one liked oneself as a person (had high self-esteem), then others would come to approve of oneself as a person? Might there be liabilities if one chronically stares into the social looking glass for external feedback about the self? Our findings revealed just such liabilities (Harter, Stocker, & Robinson, 1996) among that subgroup of adolescents.

We asked adolescents to endorse one of two orientations: either (1) “If others approve of me first, then I will like myself as a person,” or (2) “If I first like myself as a person, then others will like and approve of me.” The findings indicated that of those endorsing these two orientations, 59% selected the looking glass orientation described in the first statement, whereas the other 41% opted for the second sequence of events. That more adolescents endorsed the looking glass metatheory is not surprising given that many adolescents at this stage of development are still preoccupied with the opinions of others (Harter, 1999; Rosenberg, 1986).

Our faith in the validity of adolescents' choices was bolstered by their explanations. For example, those endorsing the looking glass self perspective offered the following types of justifications: “If other people my age don't like me as a person, then I wonder if I am a good person—I care about what people say about me”; “If no one liked you, you probably wouldn't like yourself very much”; and “If other kids approve of me and say good things about me, then I look at myself and think I'm not so bad and I start liking myself.”

In contrast, those who reversed the sequence, placing opinions of the self as causally prior to the opinions of others, gave the following types of descriptions: “In seventh grade I didn't like myself as a person, so I didn't have many people that liked me, but in eighth grade I felt more confident about myself, and then I found that I had many more friends that liked me”; “The way I figure it, if you can't like the person you are first, then how do you expect other people to like you?”; and “You have to appreciate yourself first as a person. If you wait for other people to make you feel good, then you could be waiting a long time.” The general point is that we cannot merely assume directionality, nor will our measures necessarily capture the direction of effects, unless we directly ask our participants. To the extent that their responses validate their choices, we are closer to answering questions about directionality.

However, what exactly are the next relevant questions at this point in our inquiry? Of what usefulness is it to learn about the folk theories of adolescents? Are we at the end of the conceptual road in documenting orientations about the directionality of the opinions of others and opinions about one's own sense of worth? Is it enough to turn Cooley's theory upside down, as it were, by suggesting that developmental issues are imperative to consider? My answer would be no, it is not sufficient. Are we now challenged by the need to frame a new problem for study? My answer would be yes. The general form of this question would be as follows: Of what relevance is it in the lives of adolescents that they possess one metatheory versus another? If their perceptions have no meaningful consequences, then our empirical journey might be taking us down a dead-end road.

Fortunately, we next discovered an intriguing fork in the road. We discovered that there are numerous potential liabilities for maintaining a major dependence on the opinions of others during adolescence. Our findings, based on a variety of newly constructed self-report measures to address these issues, revealed the following (for details, see Harter, 1999). First, looking glass self adolescents, as compared with those who consider their own opinions of self to be the most salient, are far more preoccupied with the opinions of others (not so surprising). Second, teachers blind to any hypotheses rated the looking glass self adolescents as behaviorally more distracted in the classroom. These adolescents were much less able to attend to or concentrate on their schoolwork, a decided liability given the importance of developing their academic skills. Third, looking glass self adolescents reported more fluctuations in peer approval. Fourth, and relatedly, looking glass self adolescents reported more fluctuations in self-esteem, an understandable link given that by definition they are basing their self-esteem on perceived peer approval. Fifth, those hermetically sealed to the social mirror also reported lower peer approval. Perhaps in their preoccupation with peer approval, they may

engage in behaviors that do not garner such support such as trying too hard and employing inappropriate strategies; in so doing, they may annoy or alienate their classmates. Finally, looking glass self adolescents' level of self-esteem is decidedly lower than that of the group whose members do not consistently base their own opinions of their worth as persons on what others think of them. This pattern among looking glass self adolescents is interpretable as follows: Because they are basing their esteem on their perceptions of the approval of others, and because they are not garnering that support, their self-esteem will suffer. Thus, the liabilities of maintaining a looking glass self are interrelated and numerous (Harter, 1999).

It seemed important to develop the logic of this extended study as a model for how one question leads to another, how one challenge provokes a new and exciting line of thought. From this perspective, there are endless fascinating questions to address; however, they must tell a story. I continue to ask my graduate students and postdoctoral trainees, when they enter my office with pounds of printouts and seem to think that these are the data, “What is the story line?” It is important to identify the narrative that our findings dictate, a narrative that will truly illuminate our understanding of the psychological processes that capture our attention. This is our ultimate goal.

The Use of Clinical Material to Help Us Frame Researchable Questions

My own background is that of both a developmental psychologist and a child clinical psychologist, and this type of joint training can provide marvelous opportunities to reflect on a clinical observation and then pursue it into the realm of research. For example, over the years in my clinical work with children, I observed that young children seemed to be unable to experience multiple emotions concerning a given event. They had particular difficulty in accepting the idea that they could have both a positive emotion and a negative emotion together (Harter, 1977). Was this a pathology-driven process? Did it reflect psychological defenses? Might there be a normative developmental component? These and many other questions arose, issues not merely to confine to one's clinical notes but rather to serve as springboards to researchable formulations that could illuminate both our clinical intervention techniques (Harter, 1977) and the cognitive developmental underpinnings of children's understanding of their emotions. Elsewhere, I have reported on a five-stage normative developmental sequence that defines the development of children's understanding of multiple emotions (Harter & Buddin, 1987). We argued that those working directly with children in a mental health capacity appreciate such a sequence as a backdrop against which to evaluate their own clients' emotional understanding. The more general point is that clinical observations initially served to drive the research questions.

To give another example of this principle, a clinical graduate student, Christine Chao, approached me with some excitement about a 4-year-old client who had an imaginary friend. Was this normal? Was it pathological? Could we find some way in which to study the processes involved? Although I had never thought about the phenomenon, together we forged a conceptual plan to investigate the role of the self in the construction of imaginary friends. Might such companions be compensating for feelings of inadequacy? What other functions might they be serving? Were there gender differences in the types of imaginary friends that young children construct? We were able to answer many of these questions (Harter & Chao, 1992). The purpose here, however, is not to detail all of our findings but rather to highlight the different sources that can stimulate our curiosity about ideas to be pursued empirically.

One last example has grown out of clinical experience. Another student, Ann Monsour, also confronted me with an interesting clinical observation. She was treating a 15-year-old female client who was terribly distressed over her “different selves” who seemed to compete with one another, to be incompatible, and to cause her tremendous grief. Monsour's burning questions were whether this was normal, pathological, or something that was treatable and how this issue could be researched. Had I thought about this? No. However, this is the point about the challenge of framing a problem. How do we frame this new problem now rather than avoid it because it might not be in our area of expertise? One develops the expertise when one faces the challenge.

Our efforts, beginning with Monsour's initial observation, have led to numerous studies (beginning with Harter & Monsour, 1992). The scientific saga has been recorded in numerous other publications (Harter, 1999). However, we are still puzzling about the fact that in four separate studies, female adolescents reported far

more conflict among their role-related selves than did male adolescents. We have yet to answer this question, and thus our challenge continues.

Openness to Serendipitous Findings

Often in the context of our concentration on one phenomenon, such as the multiple selves that emerge during adolescence, unexpected observations peak our curiosity. We became struck by the fact that during mid-adolescence, teenagers (females more so than males) gave us clues that they were struggling with the fact that they had contradictory attributes in different roles (e.g., close with mother, distant with father; rowdy with friends, self-conscious on a date). Given these disparate personae, how could they possibly determine who their “true selves” were? Some agonized about this in the interviews, asking, “Which is the real me?” Others expressed it differently by writing in the initial protocol that they were their true selves with close friends but not on dates. Once again, this was not a phenomenon to which I had directed any previous attention. However, it was so salient that it called for its own line of research (for a review, see Harter, 1999). Sometimes the problem that needs to be framed comes to us if we are open to recognizing it. This realization launched a new programmatic effort, spawned by taking seriously what children and adolescents tell us. Our goal is to listen.

Should We Let Findings that Do Not Conform to Our Hypotheses Yellow in Drawers, Never to See the Scientific Light of Day?

As many of us in the research enterprise realize, it is hard to abandon our beloved hypotheses. We search for alternative answers; for example, perhaps our methodology was ill conceived. Much of such science has not seen the light of day. Editorial journal standards might not warrant the publication of data that support the null hypothesis rather than the predictions put forth by an investigator.

Creativity, honesty, and humility must come to the fore in these situations, and we must pass on these skills to our students, colleagues, and the scientific community. Many of us have had experiences in which our pet theories were not confirmed. My own dissertation was one such example. Working under the premise that institutionalized retarded children (in the IQ range of 65–75) lacked social support and approval, I reasoned that in a learning task they would do better with social reinforcement, with regard to their problem-solving performance, than without such reinforcement. The findings turned out to be opposite those from my prediction. Those in the condition with approval did worse than those without such approval. The methodology seemed sound, and thus the fault could not lie there. Having 20/20 hindsight can be a blessing if it is followed up by further studies. The hindsight was that because these children had been so deprived of social reinforcement, it was far more rewarding to them in that condition than performing some experimental learning task where there was no human contact. Further studies supported this interpretation. The general conclusion is that we cannot let unsavory data yellow in drawers. We must have the courage to interpret the fact that many hypotheses might not be confirmed, and thus we need to go back to the conceptual drawing board.

Out of the Mouths of Babes: Children s Spontaneous Comments Can Inform Our Research

We often feel the need to follow the “correct formulas” for conducting legitimate research, to not stray from the dictates of “true science.” As a result, we may resist the temptation to take children's comments that seriously. However, often a child's innocent comments can represent insights that, if we were to listen, could change the course of a study or an entire research program. Such an experience happened in my own scientific efforts. It was 1977, and my interest in self-concept and self-esteem was growing. However, I was not content with the instruments that had been developed, specifically the Piers and Harris (1964) and Coopersmith (1967) measures that merely aggregated responses to different self-evaluative comments in domains such as academics, social relations, and athletic competence. The sum of such responses was interpreted as a reflection of one's overall sense of self-esteem, an index we later learned masked the very marked differences that children report about their sense of inadequacy across different domains.

However, another problem with such instruments was that they broached the topic of adequacy in very bald “I statements” (e.g., “I am easy to like,” “I do poorly at my schoolwork,” “I'm not very good at sports”). On such

measures, participants are given only two choices, such as true or false, about themselves. We discovered, in our own research, that self-evaluative responses on such scales were highly correlated with socially desirable responding. That is, they did not permit the children to accurately or honestly report their self-perceptions. Yet our scientific soul-searching could not provide any insights into how to solve this problem, that is, how to assess self-evaluations more accurately.

Thus, I visited a school playground looking for help from the children, the font of wisdom. I vividly recall walking up to a 9-year-old boy and, with little forethought, asking, “Do you think most kids your age think they are good at sports?” He stifled his reaction to what he thought was a most ignorant question, put his hands on his hips, and asserted, “Let's face it, some kids think they are good at sports and other kids don't think they are good at sports, right? Right!” As I drove home, I kept repeating his mantra, including the “Let's face it.” This child's comment instantly became the basis for the construction of an item format that has persisted in our measures for years. For those unfamiliar with this format, we present participants with two choices in statement form. To assess perceived athletic competence, the statement reads, “Some kids think they are good at sports, but Other kids do not think they are that good at sports.” The first part of the statement is on the left-hand side of the page, the second, on the right. Participants are asked to make two decisions. First they are asked, “Which statement is more like you?” They go to that side of the question and are then asked to make a second decision: “Is that statement REALLY true for you or just SORT OF true for you?” This allows for a 4-point scoring system. It also does not force the children to endorse “I statements.” Rather, they identify with existing groups of children, either those who believe they are good at sports or those who do not believe so. We have used this question format in numerous scales over the years, and it continues to be successful. Moreover, others can use it as well given their own interests and content. (Coda: Somewhere in the world is a 37-year-old deserving co-author who never got his due given the rules of confidentiality!)

Hypotheses from One s Own experiences

Is it legitimate to draw on one's own experiences as a source of researchable hypotheses? Different people may answer this question differently. I would submit, initially, that we do this unconsciously given the truism that we study what has touched us in our own lives. In certain cases, there is more consciousness such as when someone who has been abused chooses to study the etiology and consequences of abuse. My own example is less dramatic yet nevertheless a very conscious choice based on my own experience. Immersed in the topic of global self-esteem, a conceptual nucleus with many pseudopods, I reflected one day on the fact that my self-esteem was not equally high in all of the various domains of importance to me. Here, I was not thinking about specific competencies that we had already tapped in our measures; rather, I was questioning how much I liked and valued myself as a person in various relational contexts. A bit of introspection led me to conclude that it varied from high to low. If this was true for me, might it not be true for others? If so, at what age would such a differentiation emerge?

We began with adolescents, constructing items employing the format described previously (Harter, Waters, & Whitesell, 1998). A sample item would be the following: “Some teenagers like themselves as a person when they are around their mother BUT Other teenagers do not like themselves as a person when they are around their mother.” The children then indicate which is more like them and check whether that is “really true” or “sort of true” for them. The particular relationships can vary depending on the age of the participants, the contexts that the researcher deems important, and so on.

Our study provided clear evidence, by many statistical criteria, that adolescents definitely feel differently about their sense of worth in different relationships (for details, see Harter et al., 1998). Moreover, the findings indicate that feelings of worth in a given relationship directly relate to the social approval the children are receiving from significant others in that context. Thus, this represents a revisionist perspective on the looking glass self. Cooley, and later Mead (1934), suggested that we aggregate our perceptions of the opinions of significant others in forming a sense of our global sense of self-esteem or worth. We still embrace this conceptualization. Yet it is also interesting that with development and differentiation, adolescents come to refine this overall perception that will vary from one relationship to another. However, we have yet to examine the directionality of this correlation. Within a relationship, is it that the opinions of others dictate our sense of self, or does our own sense of self influence our perceptions of the approval we are receiving from others? Thus, our own experiences can represent another legitimate source of challenging questions, and the initial

answers only lead to more questions to be explored thoughtfully.

Challenging Claims About Issues of Relevance to Society

We owe a debt to those who have sought to illuminate psychological issues of very practical relevance to the public. (Too many in our related fields have worked within their ivory tower laboratories, churning out publishable studies that never go beyond the elitist journals that are shared only with like-minded scientists.) Others have had the courage to identify issues of relevance, attempting to stimulate public interest. One such goal is to redress certain societal ills. Three such themes are identified in closing this essay on the challenge of framing a problem. Thus, it is critical that certain research-minded investigators step out of their ivory towers and challenge certain provocative claims, to do the needed empirical research that will bring a sense of balance, accuracy, clarity, and realism.

In our own research, first, we have questioned the generalization that there is rampant gender bias against girls within the school system (American Association of University Women [AAUW], 1992; Sadker & Sadker, 1994). Second, we have refined Gilligan's (1993) contention that with the advent of adolescence, most girls lose the ability to voice their opinions. Third, we have challenged the claims of Baumeister, Smart, and Boden (1996) that there is a “dark side to high self-esteem” in that it is part of a constellation that predicts violence toward others.

We believe that it is essential that dissemination of the results of potentially relevant studies not result in overgeneralizations that can be misinterpreted, and therefore misused, with regard to public policy. The opportunity to write this essay provides a forum to caution practitioners and to encourage researchers to empirically challenge some potential myths or generalizations that require refinement or qualification.

Gender Bias in the Classroom

During the early 1990s, many claims surfaced about discrimination against girls in the classroom (AAUW, 1992; Sadker & Sadker, 1994), and the public was duly informed through media coverage in newspapers, television specials, parent magazines, and the like. Claims included the fact that girls, as compared with boys, were getting less positive attention and encouragement around schoolwork, that their bids to answer questions were ignored, that they received much less quality time from teachers, and that basically they were relegated to the silent ghetto of the classroom. It was claimed that class materials were directed toward the interests of boys and that books and curricula focused far more on the achievements of males, all of which eroded the pride and confidence of girls. The AAUW report asserted that this gender bias had been responsible for the lowered self-esteem of girls.

However, these claims were flawed for many reasons. There were virtually no compelling empirical data, and the scant measures that were employed were inadequate. Nor was statistical evidence presented to support such claims. Moreover, there was no attempt to relate teacher behaviors directly to student outcomes. There was also no attention to whether students themselves perceived gender bias. Finally, there was no appreciation for the fact that children bring to the classroom an entire history of gender-related experiences beginning from early childhood, experiences that can profoundly influence constructs such as self-esteem. These experiences may have little or nothing to do with teacher treatment in the classroom.

Our own research (Harter & Rienks, 2004; Rienks & Harter, 2005) began with an attempt to determine whether students (in a racially mixed middle school) actually perceived bias in the way that teachers responded to male and female students. Our findings revealed that approximately 80% of the students did not see bias of the nature that Sadker and Sadker (1994) had claimed. An equally critical question was whether there were any differences between these 80% and the 20% who did see bias, particularly against their own gender. The results revealed that those who did perceive bias clearly, through self-report measures, identified more negative outcomes. They reported poorer scholastic competence, lower self-worth as students, less academic motivation, and greater hopelessness about future successes. Thus, they were clearly compromised in the classroom. However, to return to a theme in our research program, does this necessarily mean that for the minority who perceived bias, the directionality flowed from teacher behaviors

to student outcomes? Might it be that such children came to the classroom with histories that led to negative experiences that, in turn, caused them to attribute current self-reported negative outcomes to teacher bias in their contemporary scholastic environment? This constitutes our next burning question in an attempt to explicate the complexities of potential gender bias. Interestingly, in contrast to Sadker and Sadker's claims about bias against girls, the boys in our study, not the girls, were more likely to report bias in that they felt that teachers were critical of their nonacademic conduct or behavior in the classroom.

Ability to Voice One's Opinions in the Classroom

Gilligan (1993), in her attempt to direct her attention to females who she believes have historically been neglected in the psychological literature, proposed a provocative hypothesis that clearly captured the attention of the psychological and educational communities as well as the popular press. It has been her thesis that pre-pubertal girls are far more clear about what they think and feel and have little hesitancy in voicing their opinions. However, with the advent of adolescence, females begin to suppress these thoughts and feelings. Gilligan and colleagues have offered several possible reasons for why many adolescent girls' voices might go underground. Realizing at mid-adolescence that they are at a crossroads, moving from the teenage years to womanhood, they look to the stereotypes of the day with regard to what it means, in our society, to be the good acceptable woman. The ideals include being empathic, caring, understanding, and quiet. Moreover, in becoming more sensitive to the relatively patriarchal society in which they are living, girls begin to realize that their voices are not as valued. In addition, to the extent that their own mothers are role models and buy into these premises, such female adolescents choose to emulate their mothers' own lack of voice. Finally, according to Gilligan, adolescent girls come to the realization that if they are to speak their true opinions forcefully, such expressions might well jeopardize their relationships. At best, doing so might threaten or compromise relationships; at worst, the girls might be rejected or abandoned. Unfortunately, Gilligan has not examined these issues in male adolescents.

These are clearly claims that would naturally provoke a person's interest, and they have been supported by the more popular press, for example, Pipher's (1994) book titled Revising Ophelia: Saving the Selves of Adolescent Girls. Although it is commendable to focus on a supposedly neglected gender, one cannot simply make claims about one gender without examining the other gender. Hamlet had his own problems with indecision and confidence; he spoke in soliloquies and monologues, not in dialogues.

Therefore, our own research has sought to examine the issue of voice in both male and female adolescents, ages 12 to 18 years (for a summary of these studies, see Harter, 1999). Basically, we have found no evidence, with cross-sectional data, that girls' level of voice declined across five different relationships. We found no significant gender differences, and those that we did find slightly favored girls' level of voice. What did we find of interest? We discovered tremendous individual differences in level of voice for both boys and girls. This was the next burning question to be addressed: What accounted for these vast differences within each gender? Perhaps the most critical determinant for both genders was the level of support for voice within each relational context (parents, close friends, female classmates, male classmates, and teachers). The findings were very clear. For each gender, the more support for expressing one's opinions, the higher one's level of voice within that context. Perhaps this is not a startling finding, but it had to be documented to identify a critical cause of individual differences in level of voice within each gender.

In addition, we examined gender orientation, and the results were particularly revealing for female adolescents. We identified both those with a predominantly feminine orientation and those with an androgynous orientation (i.e., those who endorsed both feminine and masculine stereotypes). We found that level of voice depended on gender orientation in interaction with the relational contexts just identified. Feminine girls expressed lower levels of voice, as compared with androgynous girls, in the more public contexts, namely, with classmates and teachers at school. However, feminine and androgynous adolescent girls reported equally high levels of voice within more personal relationships, namely, with close friends and parents.

What is our conclusion? Based on these findings, we would conclude that there is a subset of girls, the feminine girls (who during the late 1990s were in the minority), who do seem to stifle their voices in certain situations, namely, the more public contexts. This suggests to us that Gilligan's (1993) thesis is applicable to

thatsubset of girls in those relational situations. Our point is that one needs to move to this level of analysis: What subsets of girls and boys, what contexts, what motives, and what predictors lead to our understanding of level of voice? This is the direction that not only will further our science but also will help us to understand the individuals in our lives, be they our children, our students, our clients, our friends, or other family members. Such an individual difference approach can help us to frame problems more creatively.

Is There a Dark Side to High Self-Esteem?

For many years, in examining the determinants of level of self-esteem (for a review, see Harter, 1999), we have been committed to identifying the predictors, correlates, and consequences of level of self-esteem. The work that was reported earlier in this chapter revealed that we and others have consistently found that low self-esteem is highly predictive of depressive symptoms and suicidal thinking, namely, internalizing symptoms. In reviewing and later researching the predictors of violent ideation (and media-reported behavior in the case of the school shooters), we also documented in our own work the finding that low self-esteem and its predictors can lead to violent ideation as well (Harter et al., 2003). Thus, we were intrigued when Baumeister and colleagues (1996) proposed that there is a dark side to high self-esteem. This formulation, intended for adults, suggested that high self-esteem, within a constellation of narcissism, low empathy, sensitivity to evaluations from others, and potentially fluctuating or fragile self-esteem, can lead to violent ideation or behavior in the face of psychological threats to the ego. This is certainly an interesting formulation, and in articles and the popular press (e.g., the New York Times), a headline reading “The Dark Side of High Self-Esteem” is certainly an attention grabber.

We sought to examine this issue among adolescents given that violent ideation and violent behavior have become of central interest during recent years. Our measures have specifically targeted thoughts of violent ideation when humiliated, namely, threats to the ego in Baumeister and colleagues' (1996) terms. We are in agreement that such threats, resulting in feelings of humiliation, are central mediators of potentially violent thoughts that could possibly lead to violent behavior. However, is high self-esteem a villain in this psychological plot? Our own results with adolescents suggest otherwise. Our own findings indicate that humiliation in the face of threats to the ego, narcissism, and lack of empathy are key predictors of violent ideation, consistent with Baumeister and colleagues' claims. However, high self-esteem is not part of the predictive formulation. Self-esteem, as a predictor of violent ideation, is either negatively related or nonstatistically related. These results also suggest the need to thoughtfully distinguish between narcissism and high self-esteem because if they are assessed appropriately, they are not correlated (Harter & McCarley, 2004). Thus, our research does not reveal that there is a dark side to high self-esteem. Rather, narcissism (defined as feelings of entitlement, superiority, and self-aggrandizement) in conjunction with lack of empathy do predict violent thoughts that could lead to violent behavior. We need to move beyond the sensationalism of school shootings to develop thoughtful hypotheses about other dynamics such as how such violent thinking could compromise development in other areas such as lack of academic progress and difficulty in developing social skills. These are our challenges. We need to develop models that will assist us in identifying individuals who may be compromised and in need of interventions. Initially, as researchers, we look for general patterns, but we need to go beyond gender, age level, ethnicity, and other demographics to examine processes that will help us to understand individuals.

Conclusions

Our scientific enterprise has touted the hypo-thetico-deductive method in which “top-down” models, beginning with theory, dictate research formulations and empirical efforts. Yet increasingly, more inductive methods have come to the fore. Observations of real-life behaviors have come to attract the attention of many, not as conclusions but rather as grist for the empirical mill. Interesting observations and thoughtful approaches can drive our inquiry, frame specific questions, and dictate a research strategy.

As the introduction to this chapter revealed, I discovered this as a child. Could a banty hen patiently sit on a large duck egg for the requisite period of time and hatch a different species that would become her offspring? Would the duckling, Yankee Doodle, survive a child's experiment that he be required to swim immediately after his hatching? Would a petite hen and gangling duckling bond as mother and offspring? These were my

own burning questions given childhood curiosity and a natural laboratory in which to investigate such issues.

We need to foster these processes in our children, in our students, and in ourselves. We need an educational system that promotes this type of curiosity and exploration. Too many children are turned off to science as it is taught in many schools today. On a beautiful sunny spring Friday, our daughter came home distraught, bemoaning the fact that she had to memorize the periodic table for her chemistry class. Sharing her distress, I suggested a better idea. It was time to plant the garden, and among other preparations, I had just purchased onion sets. “Let's try an experiment—plant half of them right side up and half of them upside down and see what happens.” Gleefully, she ran out to the garden plot and we cordoned off two rows. For days, she vigilantly checked, asking eagerly but impatiently, “How long do we have to wait?” About 21 days later, we had our answer. Both rows of onions looked identical with many healthy scallions.

Our daughter was incredulous. “You mean under the ground the ones we planted upside down knew how to turn themselves right side up?” She had answered one of her first scientific burning questions with interest and enthusiasm. To this day, she recalls nothing about the periodic table. However, she has a profound memory of onions, instinct, and how to frame a meaningful question. Moreover, she will transfer these lessons to her kindergarten children and her young son.

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- self-reports
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