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Review Article

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Navigating Evolutionary Biology Careers: A Review of Factors Influencing Black and African American Undergraduate Students' Career Decision-Making

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Abstract: The persistent underrepresentation of Black and African American individuals in evolutionary biology represents a critical challenge for STEM diversity and scientific equity. This review synthesizes recent qualitative research examining the multifaceted factors that influence Black and African American undergraduates' career interests and decision-making processes related to evolutionary biology. Drawing on Social Cognitive Career Theory and constructivist frameworks, this analysis examines three primary thematic domains: (1) career compatibility, encompassing racial representation, historical context, and religious identity; (2) career knowledge, including awareness and perceptions of evolutionary biology careers; and (3) family influence, covering expectations, support dynamics, and religious tensions. The review identifies significant gaps in career awareness, the impact of systemic racism and historical misuse of evolutionary theory, the complex interplay between religious identity and scientific acceptance, and the powerful role of familial expectations in shaping career trajectories. Based on these findings, the review presents evidence-based recommendations for institutional reform, inclusive pedagogy, culturally responsive career advising, and family engagement strategies. These recommendations aim to dismantle barriers and foster a more inclusive, equitable evolutionary biology workforce that reflects the diversity of the broader society.

Keywords: *evolutionary biology, career development, Black undergraduates, African American students, STEM diversity, religion, family influence, representation,*

1. Introduction

The underrepresentation of historically excluded communities (HECs) in science, technology, engineering, and mathematics (STEM) fields remains one of the most pressing challenges facing higher education and scientific institutions in the United States. Within the broader landscape of STEM inequity, evolutionary biology presents a particularly complex case, characterized by intersecting barriers related to race, religion, historical context, and career visibility (Graves, 2019; O'Brien et al., 2020; Mead et al., 2015). Despite decades of diversity initiatives and increased attention to inclusive excellence, Black and African American individuals continue to be significantly underrepresented in evolutionary biology, reflecting persistent systemic barriers that limit entry, retention, and advancement in the field (National Science Foundation [NSF], National Center for Science and Engineering Statistics [NCSES], 2020; Rushworth et al., 2021).

Understanding the factors that influence Black and African American undergraduates' career decision-making in evolutionary biology requires moving beyond simplistic explanations that focus solely on individual interest or ability. Instead, a comprehensive analysis must account for the complex interplay of psychological, sociocultural, familial, cognitive, religious, and institutional factors that shape how students perceive, evaluate, and ultimately select—or reject—career pathways in evolutionary biology (Lent et al., 1994; Byars-Winston, 2015; Cooper, 2005). This review synthesizes recent qualitative research to examine these multifaceted influences and presents evidence-based recommendations for fostering a more inclusive and equitable evolutionary biology workforce.

The significance of this topic extends beyond questions of workforce diversity. The underrepresentation of Black and African American scientists in evolutionary biology has profound implications for the production of knowledge, the direction of research agendas, and the field's capacity

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to address questions relevant to diverse communities (Graves, 2019; O'Brien et al., 2020). Moreover, the historical misuse of evolutionary theory to legitimize racist ideologies—including eugenics, scientific racism, and biological determinism—has created lasting wounds that continue to affect how communities of color perceive and engage with evolutionary biology (Brem et al., 2003; Graves, 2019). Addressing these historical legacies is essential not only for increasing representation but also for ensuring that evolutionary biology evolves into a discipline that is scientifically rigorous, ethically grounded, and socially responsible.

This review is organized around three primary thematic domains that emerged from recent qualitative research: career compatibility, career knowledge, and family influence. Within each domain, we examine the specific factors that shape students' perceptions and decisions, drawing on theoretical frameworks from career development psychology, science education, and critical race theory. We conclude with a series of evidence-based recommendations for faculty, institutions, and policymakers aimed at dismantling barriers and creating pathways for Black and African American students to thrive in evolutionary biology careers.

2. Theoretical Framework

2.1 Social Cognitive Career Theory

The analysis presented in this review is grounded primarily in Social Cognitive Career Theory (SCCT), developed by Lent et al. (1994). SCCT provides a robust framework for understanding how individuals develop career interests, make career choices, and achieve career success. Central to SCCT are three interconnected constructs: self-efficacy beliefs (confidence in one's ability to perform career-related tasks), outcome expectations (beliefs about the consequences of career-related actions), and personal goals (intentions to engage in particular activities or attain certain outcomes).

SCCT posits that career-related self-efficacy and outcome expectations are shaped by four primary sources of learning: personal performance accomplishments, vicarious learning (observing others), social persuasion, and physiological and affective states (Lent et al., 1994). For Black and African American students considering careers in evolutionary biology, each of these learning sources may be compromised by systemic barriers. Limited representation of scientists of color reduces opportunities for vicarious learning; experiences of discrimination and microaggressions can undermine self-efficacy; and negative social persuasion from family members or peers who view evolutionary biology as incompatible with religious beliefs or financially unstable can diminish outcome expectations (Byars-Winston, 2015; Cooper, 2005).

Career Decision Self-Efficacy, a specific construct within SCCT, reflects students' confidence in their ability to make effective career choices and has been shown to strongly predict career clarity and persistence (Chaney et al., 2007). Self-perceived competence in math and science consistently correlates with intentions to pursue related careers (Falco & Summers, 2017). However, these psychological dimensions do not operate in isolation; they interact dynamically with broader sociocultural influences, including family expectations, socioeconomic status, and cultural values (Quayson, 2021; Witherspoon & Speight, 2009).

2.2 Constructivist Paradigm and Qualitative Approaches

The research synthesized in this review employed qualitative methodologies grounded in a constructivist paradigm, which recognizes that individuals actively construct meaning from their experiences within specific social and cultural contexts (Creswell & Poth, 2018). This approach is particularly well-suited to examining career decision-making among Black and African American students because it allows for the exploration of lived experiences, meaning-making processes, and the complex ways in which individuals navigate multiple, sometimes conflicting, identity domains.

Constructivist qualitative methods, including semi-structured interviews and thematic analysis, enable researchers to capture the depth and nuance of participants' perspectives—elements that are often inaccessible through quantitative approaches alone. The constant comparative method, involving iterative coding, memo-writing, and theoretical saturation, ensures that emergent themes accurately represent the complexity of participants' experiences (Glaser & Strauss, 1967).

2.3 Critical Race Theory and Historical Context

Critical Race Theory (CRT) provides an essential lens for understanding the historical and structural dimensions of underrepresentation in evolutionary biology. CRT emphasizes the centrality of race and racism in shaping social institutions, including science and higher education, and challenges the notion that scientific fields are neutral or objective spaces (Delgado & Stefancic, 2017). The application of CRT to evolutionary biology education reveals how the field's history—including the misuse of evolutionary concepts to justify slavery, colonialism, eugenics, and racial hierarchies—continues to affect contemporary participation patterns (Graves, 2019; O'Brien et al., 2020).

Students' awareness of this problematic history is not merely an academic concern; it shapes their sense of belonging, their trust in scientific institutions, and their willingness to engage with evolutionary biology as a career path. CRT thus underscores the importance of explicitly addressing historical racism in science education rather than treating it as a peripheral or

uncomfortable topic to be avoided (McGee, 2020; Weissmann et al., 2019).

3. Career Compatibility: Representation, Racism, and Belonging

3.1 Underrepresentation and Perceived Barriers

One of the most salient themes emerging from recent research is the profound impact of racial underrepresentation on Black and African American students' sense of career compatibility in evolutionary biology. Students consistently identified the visible lack of racial diversity in the field as a significant barrier to their sense of belonging and professional viability (Montañez et al., 2026). Participants described looking for mentors and role models who shared their racial identity and finding few or none, which diminished their confidence that they could succeed in the field.

The absence of same-race role models is not merely a matter of symbolic representation; it has concrete implications for students' career self-efficacy and outcome expectations. According to the stereotype inoculation model, exposure to ingroup experts and peers can protect individuals from the negative effects of stereotypes on their self-concept and academic performance (Dasgupta, 2011). Conversely, the absence of such role models can reinforce perceptions that certain fields are "not for people like me," undermining interest and persistence (Marx & Roman, 2002; O'Brien et al., 2020).

Students also articulated concerns about everyday discrimination and microaggressions that they anticipated encountering in evolutionary biology careers. These concerns were not abstract; they were grounded in experiences of racial marginalization in academic settings and broader societal patterns of discrimination. Students described how the combined effects of historical misuse of science, racial underrepresentation, and perceived discrimination could make the field feel inaccessible or unwelcoming, even when they possessed genuine intellectual interest in evolutionary topics (Montañez et al., 2026).

3.2 Historical Misuse of Evolutionary Theory

A particularly distinctive aspect of evolutionary biology, compared to other STEM fields, is its historical association with racist and sexist ideologies. Several students in recent studies demonstrated sophisticated awareness of how evolutionary concepts had been co-opted to justify eugenics, racial hierarchies, and biological determinism (Montañez et al., 2026). This awareness shaped their perceptions of the field's compatibility with their identities and values.

Participants referenced pseudoscientific research on human skull size, intelligence, and race, noting that such "research" represented inappropriate and incorrect interpretations of evolutionary theory. However, the fact that these ideas had been propagated under the banner of evolutionary science created lasting suspicion and discomfort. As one participant noted, there is "a history of...pseudoscience...that comes with race and evolution," which has been "used to...justify different levels of...equality or like access to things among different racial groups" (Montañez et al., 2026).

Importantly, students' awareness of this history did not necessarily lead to rejection of evolutionary biology as a career path. On the contrary, several participants articulated a vision of themselves as agents capable of reshaping the field. They positioned increased representation of Black and African American scientists in evolution as a critical counterpoint to historical misuse, emphasizing that "evolution...is important for someone in my race to pursue, to sort of combat...long standing...ideologies that aren't representative of reality" (Montañez et al., 2026). This finding suggests that acknowledging the field's problematic history—rather than ignoring it—may actually enhance students' sense of purpose and agency, provided that institutions demonstrate genuine commitment to equity and inclusion.

3.3 Compatibility Between Evolution and Personal Career Interests

When asked to reflect on the compatibility between evolutionary biology and their personal career interests, students' responses revealed a complex pattern of partial alignment. Many participants recognized evolution as scientifically significant and intellectually relevant to their intended careers, particularly in medicine, but did not view it as central to their professional aspirations (Montañez et al., 2026).

Medicine emerged as the most commonly identified career interest among biology majors, and students frequently described how evolution provided foundational knowledge for understanding disease, drug resistance, and human variation. However, they typically viewed this connection as indirect or peripheral to their day-to-day professional practice. As one participant explained, "medicine, it's obviously based on humans, which...humans come from evolution. So I guess it's related in that sense, but when you're practicing medicine, you're not really thinking about evolution" (Montañez et al., 2026).

This pattern of partial career compatibility highlights a significant gap in how evolutionary biology is presented and perceived in undergraduate education. While students may appreciate evolution's conceptual importance, they often fail to see how it could form the basis of a viable, fulfilling career. This disconnect is exacerbated by limited exposure to the diverse career pathways within evolutionary biology, including fields such as computational biology, epidemiology, conservation genetics, science policy, and science communication (Bridgstock & Hearn, 2012; Bridgstock et al., 2019).

3.4 Interest in Evolution as an Academic Topic

Despite the challenges described above, the vast majority of students expressed genuine interest in evolution as an academic topic, particularly as they engaged with it in college-level courses. Many described their experiences learning about evolution as transformative, using words like "breathtaking," "eye-opening," and "fascinating" (Montañez et al., 2026). Topics involving human evolution—such as the relationship between melanin, folic acid, and skin pigmentation—were particularly resonant, as they connected scientific concepts to students' own identities and experiences.

This finding has important implications for evolution education. It suggests that high-quality, inclusive evolution instruction can foster deep intellectual engagement and lasting interest, regardless of students' ultimate career intentions. However, it also reveals a critical disconnect: interest in evolution as a topic does not automatically translate into interest in evolution as a career. Participants consistently distinguished between finding evolution intellectually stimulating and desiring to pursue it professionally, citing uncertainty about career pathways, concerns about financial viability, and lack of alignment with their passions or career identities (Montañez et al., 2026).

4. Religion and Career Compatibility

4.1 Religion as a Source of Support and Guidance

Religion played a significant and multifaceted role in the lives of the majority of Black and African American students in recent studies. For many participants, religious faith provided emotional support, social connection, and guidance during periods of academic stress and decision-making. Students described turning to prayer or religious practices when facing challenges, and many identified their faith community as a critical source of belonging and resilience (Montañez et al., 2026).

The supportive role of religion within Black and African American communities is well-documentated in the literature. Religious institutions have historically served as centers of social organization, mutual aid, and resistance against oppression, and they continue to play a vital role in many students' lives (Chatters et al., 2009; Krause, 2002, 2003, 2006). For students navigating predominantly White academic environments, religious communities may offer a sense of cultural grounding and psychological safety that is absent in secular spaces.

However, this supportive role can create complex tensions when religious beliefs appear to conflict with scientific content, particularly evolutionary theory. The paradox of religion as both a source of strength and a potential barrier to scientific engagement has been documented in previous research on evolution education among religious students of color (Barnes et al., 2020a, 2020b; Ferguson et al., 2024).

4.2 Perceived Conflict Between Religion and Evolution

Approximately half of the students in recent studies reported perceiving some degree of conflict between their religious beliefs and evolutionary theory, with a subset viewing the two as fundamentally incompatible. This perceived conflict was most pronounced regarding human evolution and creation, where evolutionary explanations were seen as challenging the existence of a divine creator or the special status of humans as described in religious texts (Montañez et al., 2026).

Students who perceived strong conflict between religion and evolution were less open to considering evolution-related careers. As one participant stated, "I wouldn't enjoy [a career in evolution]...I don't believe in evolution, so I wouldn't want to have a career related to that" (Montañez et al., 2026). Another explained that their religious beliefs directly influenced career decisions: "if you believe in certain things like within your faith...and there's a career that's asking for you to do something that probably goes against your beliefs, you're not going to go towards that path" (Montañez et al., 2026).

This perceived conflict was not uniform, however. A substantial proportion of students did not view religion and evolution as conflicting, and some actively described ways of integrating or compartmentalizing the two domains. Responses ranged from viewing evolution as "just like another topic we learn in school like math" to explicitly stating that "I believe in something too, but I also do take in all the facts that science is putting in front of my face. So it's not conflicting. I just understand both of them" (Montañez et al., 2026).

The heterogeneity of students' responses underscores the importance of avoiding monolithic assumptions about how religious identity intersects with scientific engagement. While some students experienced direct conflict, others managed tension through selective acceptance, compartmentalization, or integration. These varied responses suggest that effective evolution education and career advising must be responsive to individual students' perspectives rather than assuming a single, uniform relationship between religion and science (Barnes & Brownell, 2018; Southerland & Scharmann, 2013).

4.3 Familial Religious Influence

The intersection of religion and career decision-making was further complicated by familial influences. Older generations in Black and African American families often exhibit stronger religious adherence, and students anticipated that their family members would view evolution as incompatible with core faith traditions (Krause, 2002, 2003, 2006). This anticipation created additional pressure, as students weighed their personal

interests against perceived familial expectations and potential conflict.

Many participants described how discussing evolution with their families would be challenging due to strong religious beliefs that were viewed as conflicting with evolutionary theory. The anticipated difficulty of these conversations—ranging from "very difficult" to "slightly difficult" for the majority of participants—served as an additional barrier to exploring evolution careers, even for students who did not personally perceive a conflict between their own religious beliefs and evolution (Montañez et al., 2026).

5. Career Knowledge: Awareness and Perceptions of Evolutionary Biology Careers

5.1 Confusion and Lack of Awareness

A striking finding from recent research is the widespread confusion and lack of awareness among Black and African American undergraduates about what careers in evolutionary biology actually entail. Despite being enrolled in or having completed introductory evolution-focused biology courses, many students expressed fundamental uncertainty about the existence, nature, and scope of evolution-focused careers (Montañez et al., 2026).

Participants asked clarifying questions such as "What is an evolution career?" and "What does it mean...evolution career?" Others noted that they had "never really thought about" evolution as a career path and that it "wasn't...a career that people pushed towards...us [minorities]" (Montañez et al., 2026). This confusion was sometimes explicitly linked to perceptions of who is likely to encounter or pursue such careers, with students noting that evolution "isn't a very widely known career field, so less likely Black people know about it, therefore going into it" (Montañez et al., 2026).

This lack of awareness represents a form of "state uncertainty" about careers—a temporary uncertainty stemming from limited information and exposure rather than stable personal characteristics (Xu, 2023). State uncertainty is particularly prevalent among students from underrepresented backgrounds who may lack access to social networks and institutional resources that provide career information (Mead et al., 2015). Addressing state uncertainty requires proactive institutional efforts to embed career awareness within degree programs and to connect students with professionals in the field.

5.2 Limited and Inaccurate Perceptions

Among students who felt they had some knowledge of evolution-related careers, many demonstrated narrow or inaccurate conceptualizations that limited their interest and sense of fit. Common perceptions included viewing evolutionary biology careers as focused exclusively on studying animals, documenting species progression, or engaging in archeological or adventurous fieldwork (Montañez et al., 2026).

These limited conceptualizations were often intertwined with perceptions of practicality and social value, particularly in relation to race, class, and family expectations. Students described how their families and communities viewed evolution careers as impractical, low-paying, or lacking prestige compared to more traditionally recognized fields such as medicine, law, or engineering. As one participant explained, "I feel that my race sees the evolution career as something that's like, that doesn't make any sense or is like low or something. So they would want something that's clear...That's gonna grant, like a huge amount of success, but also practical" (Montañez et al., 2026).

Others framed these views within broader socioeconomic and immigration-related contexts, noting that "our parents aren't earning a crazy amount of money...we come from [immigrant] households that only see a few careers as good careers" (Montañez et al., 2026). These constrained views may discourage students who might otherwise be interested in the broader applications of evolutionary principles, including fields such as genetics, medicine, environmental science, computational biology, and public health.

The gap between students' limited perceptions and the actual diversity of evolutionary biology careers represents a critical target for intervention. Without accurate information about the range of career possibilities, students cannot make informed decisions about whether evolutionary biology aligns with their interests, values, and goals.

6. Family Influence on Career Decision-Making

6.1 The Centrality of Family in Black and African American Students' Lives

Family emerged as a powerful and complex influence on Black and African American students' career decision-making processes. Research consistently demonstrates that Black and African American families, particularly parents, exert substantial influence on their children's career aspirations—more significantly than White families—leading to reports of less independent decision-making among Black and African American students regarding careers (Alliman-Brissett, 2004; Constantine et al., 2005; Smith, 2011; Jackson, 2016; Marks, 2018).

When asked to define "family," students' responses varied widely, encompassing immediate and extended relatives, close friends, mentors, pastors, and teachers. This expansive definition of family reflects the communal orientation that characterizes many Black and African American cultural contexts, where support networks extend beyond biological ties to include individuals who provide emotional, financial, and social support (Montañez et al., 2026).

Participants described receiving multiple forms of support from their families, with emotional support being the most frequently cited, followed by financial support. Emotional support included encouragement, motivation, and reassurance, while financial support was critical for covering tuition, housing, and other college-related expenses. The multifaceted nature of family support underscores the deep interdependence between students and their families, which has significant implications for how students navigate career decisions that may diverge from familial expectations.

6.2 Family Career Expectations and Perceived Autonomy

Many participants described their career choices as being strongly influenced by their families' expectations and perceptions of what constitutes a "compatible" or acceptable career. When considering career paths that diverged from familial support, students reported feelings of conflict, pressure, and emotional strain. The degree of perceived autonomy in career decision-making varied across the sample: some students felt they needed to adhere strictly to family expectations, others factored family expectations into their decisions while maintaining some personal agency, and a smaller group prioritized personal interest over family expectations (Montañez et al., 2026).

For students whose families had long steered them toward specific careers—most commonly medicine—deviating from these expectations was difficult to imagine. As one participant shared, "since I've been a child...I've always said that I wanted to go into the health field or be a doctor...so I feel like I need to follow" (Montañez et al., 2026). Another described how family disagreement could lead to internal conflict and potential changes in intended paths, explaining that if family members were "100% against [it], it's not something I would follow" (Montañez et al., 2026).

The emotional weight of familial expectations was palpable in many students' accounts. Participants described how diverging from family-defined notions of acceptable careers would generate feelings of having "let them down" or "disappointed them in some way" (Montañez et al., 2026). These reflections demonstrate that career interests are not made in isolation but are intertwined with families' values, expectations, and practical concerns. When a career path such as evolutionary biology does not align with families' frameworks, students may struggle to see it as a viable or acceptable option, regardless of personal interest.

6.3 Family Knowledge and Perceptions of Evolution Careers

A significant barrier identified by students was their family members' lack of knowledge about evolutionary biology careers. Across interview responses, a substantial proportion of participants indicated that their family members were unfamiliar with evolution-related careers or what such careers entail (Montañez et al., 2026). This lack of understanding resulted in confusion, skepticism, and discouragement, particularly in relation to more traditionally recognized and financially secure career paths.

Students described how their families would respond with questions like "what does that mean?" and "what can you do with it?" when presented with the possibility of an evolution career. Many believed that their family members lacked sufficient knowledge about evolution careers to offer meaningful support or encouragement. As one participant noted, "none of my family has an evolution curiosity. I don't think they have ever looked into it or even know what a career in evolution would be. So they'd probably be...most disconnected" (Montañez et al., 2026).

This lack of understanding extended to financial concerns, with several participants describing family members expressing worry about the perceived financial instability or limited earning potential of evolution-related careers. Students recounted how parents viewed careers like medicine or law as "the fastest ways to finding a job, and always having a job and getting a good salary," whereas evolution careers were seen as risky or illegitimate (Montañez et al., 2026). These perceptions, while based on limited information, carried significant weight in students' career considerations due to the importance they placed on familial approval and support.

6.4 Family Views on Evolution and Religion

The intersection of family, religion, and evolution created particularly complex dynamics. Many participants anticipated that discussing evolution with their families would be challenging due to strong religious beliefs that were viewed as conflicting with evolutionary explanations. This perceived difficulty was most pronounced regarding human evolution, which was seen as directly contradicting religious teachings about divine creation (Montañez et al., 2026).

Students described how family members, particularly older generations, were "so set in their ways in their religion" that discussing evolution would be considered "blasphemy" (Montañez et al., 2026). Others anticipated that attempts to explain evolution would be met with "straight out denial" or that conversations would be like "talking to a wall" (Montañez et al., 2026). These anticipated conflicts created additional barriers to exploring evolution careers, as students worried about the emotional and relational costs of pursuing a path that their families might reject on religious grounds.

However, not all participants viewed these conversations as inherently difficult. A subset described their families as receptive, open-minded, or supportive of their educational

pursuits regardless of specific content. Some attributed this receptivity to prior exposure to integrative science-religion frameworks, such as Catholic school education that explicitly addressed the relationship between religion and evolution (Montañez et al., 2026). These contrasting perspectives highlight the heterogeneity of family dynamics and the importance of avoiding monolithic assumptions about how religious families will respond to evolution-related career interests.

7. Discussion and Synthesis

7.1 Intersecting Barriers and Heterogeneous Experiences

The findings synthesized in this review reveal a complex constellation of interrelated factors that influence Black and African American undergraduates' career decisions in relation to evolutionary biology. These factors do not operate in isolation; rather, they intersect and compound in ways that create unique barriers for individual students. A student who perceives conflict between their religious beliefs and evolution, whose family holds strong expectations for a medical career, and who has never encountered a Black evolutionary biologist faces a qualitatively different set of challenges than a student for whom only one or two of these factors apply.

Importantly, the research emphasizes remarkable heterogeneity in students' experiences and perspectives. Not all participants viewed evolution and religion as conflicting, nor did they anticipate such a perspective among their family members. While nearly all students reported that family was an important source of support, the types of support provided differed, as did the extent to which students perceived their family would respond poorly to an evolution career. This heterogeneity underscores the limitations of one-size-fits-all approaches to diversity and inclusion in STEM and highlights the need for individualized, culturally responsive support (Montañez et al., 2026).

7.2 The Role of Historical Context in Contemporary Decision-Making

A distinctive contribution of recent qualitative research is its illumination of how historical context shapes contemporary career decision-making. Students' awareness of the racist history of evolutionary biology was not merely academic; it informed their sense of whether the field was a space where they could belong and thrive. This finding extends prior work documenting how historical misuse of evolutionary theory continues to affect public perceptions of evolution, particularly among communities of color (Brem et al., 2003; Graves, 2019).

The implications for practice are significant. Institutions and faculty must move beyond superficial diversity initiatives to engage substantively with the historical and ongoing impacts of racism in science. This includes critically examining how curricula present the history of evolutionary biology, acknowledging the field's complicity in racist ideologies, and highlighting the contributions of scientists of color who have challenged and transformed the discipline (Weissmann et al., 2019; Crowell, 2025; Gewin, 2024).

7.3 From Interest to Career: The Knowledge Gap

A critical finding across studies is the disconnect between students' intellectual interest in evolution and their consideration of evolution as a career path. While the vast majority of students found evolution interesting—often describing their coursework as transformative—few viewed evolutionary biology as a viable career option. This gap between interest and career consideration is attributable to multiple factors: limited awareness of what evolution careers entail, narrow perceptions of the field's scope, concerns about financial viability, and lack of visible role models who have successfully navigated these career paths.

This finding aligns with broader research on STEM career development, which has shown that disciplinary interest is necessary but not sufficient to diversify STEM fields (Seymour et al., 2019; President's Council of Advisors on Science and Technology [PCAST], 2012). Converting intellectual interest into potential career engagement requires intentional institutional efforts to demystify career pathways, provide authentic research experiences, and connect students with professionals who can serve as mentors and models (Bennie et al., 2025; Hillermann et al., 2024).

7.4 Family as Both Resource and Constraint

The research consistently positions family as a dual influence—both a critical resource and a potential constraint on students' career exploration. On one hand, family members provide essential emotional and financial support that enables students to pursue higher education. On the other hand, familial expectations, limited knowledge of non-traditional careers, and religious beliefs can create pressure that narrows students' career considerations and discourages exploration of fields like evolutionary biology.

This duality has important implications for institutional practice. Rather than viewing family influence as an obstacle to be overcome, institutions should recognize families as partners in students' educational success. This requires developing strategies to engage families as allies, providing them with accurate information about career possibilities, and creating spaces for open dialogue about the relationship between science, religion, and career aspirations.

8. Recommendations for Practice and Policy

Based on the findings synthesized in this review, we present evidence-based recommendations organized by stakeholder group and thematic area. These recommendations aim to address the multifaceted barriers

identified in the research and to create more inclusive, accessible pathways for Black and African American students into evolutionary biology careers.

8.1 Addressing Racism, Representation, and Belonging

For Faculty:

- Actively acknowledge and critically discuss the history of exclusion and misuse of evolutionary theory (e.g., eugenics, scientific racism) in biology and evolution courses. Research indicates that acknowledging this history, rather than ignoring it, helps foster awareness and validation among students from marginalized backgrounds (Weissmann et al., 2019; Brem et al., 2003).
- Highlight contributions of scientists of color to evolutionary biology, both historical and contemporary, to provide vicarious learning opportunities and challenge stereotypes about who belongs in the field (Dasgupta, 2011; Marx & Roman, 2002).
- Promote inclusive classroom practices that validate diverse experiences and create conditions for rightful presence in STEM (Calabrese Barton & Tan, 2019).
- Integrate critical discussions on the misuse of evolutionary theory alongside examples of how contemporary evolutionary biologists are working to advance social justice and equity.

For Institutions:

- Invest in recruiting and retaining diverse faculty in evolutionary biology departments. The presence of same-race role models and mentors is critical for students' sense of belonging and career self-efficacy (Griffin, 2020; O'Brien et al., 2020).
- Fund mentorship pipelines, including summer research programs, bridge programs, and research experiences for undergraduates (REUs), that prioritize equity and belonging.
- Name and openly address issues of racism in departmental culture. Creating an environment where students feel they can legitimately claim membership in the scientific community requires explicit, sustained attention to systemic barriers (McGee, 2020; Calabrese Barton & Tan, 2019).
- Develop and maintain alumni networks that connect current students with professionals from underrepresented backgrounds working in evolutionary biology and related fields.

8.2 Bridging Interest and Career Pursuit

For Faculty:

- Make explicit links between evolutionary biology and applied fields that students already find appealing, such as medicine, conservation, agriculture, science communication, and public health. Demonstrating the relevance of evolution to diverse career goals can help students envision evolutionary biology as compatible with their aspirations (McCartney & Colon, 2023).
- Host "career spotlights" during class sessions featuring professionals with diverse evolutionary careers, including non-academic paths in biotechnology, environmental consulting, museum education, and science policy.
- Incorporate reflections and assignments that prompt students to consider how evolution intersects with their personal interests and career goals.
- Invite guest speakers from fields like computational biology, paleontology, epidemiology, and science policy to showcase the breadth of evolution-related work.

For Institutions:

- Develop interdisciplinary minors and co-curricular learning opportunities that connect evolutionary biology to diverse student interests.
- Ensure that career services resources include clear, accessible descriptions of evolution-aligned careers and highlight them in newsletters, job fairs, and advising materials.
- Track and share career outcomes of graduates in evolution-related roles to build a visible, diverse portfolio of professional pathways.
- Create career myth-busting resources collaboratively with faculty that challenge misconceptions (e.g., "evolution means becoming a professor") and showcase alternative paths.

8.3 Expanding Career Knowledge and Awareness

For Faculty:

- Introduce subdiscipline-specific career content directly into introductory and upper-level biology curricula. This approach has shown promise in K-12 and undergraduate settings for increasing career awareness (Cohen & Patterson, 2012; Salonen et al., 2018).
- Assign readings, videos, or case studies showcasing what evolutionary biologists actually do in various professional contexts.
- Provide authentic research experiences, fieldwork opportunities, and outreach activities that demystify what evolution careers look like in practice (Bennie et al., 2025; Hillermann et al., 2024).

For Institutions:

- Develop discipline-focused career development courses that support STEM identity formation and career interest, particularly when offered early in undergraduate programs (McCartney & Colon, 2023).
- Maintain alumni networks and mentorship programs focused on evolutionary careers, enabling students to speak directly with professionals about their experiences.
- Ensure career advisors are knowledgeable about the diverse pathways within evolutionary biology and can engage students in reflective conversations about how evolution intersects with their personal interests.

8.4 Navigating Religious Identity and Science

For Faculty:

- Create dedicated space in biology education to discuss the perceived conflict between religion and evolution—not to resolve it definitively, but to validate student perspectives and promote epistemic humility. Acknowledging students' religious beliefs in the context of evolution instruction has been argued to be critical for helping students reconcile perceptions of conflict with science (Aini et al., 2025; Bertka et al., 2019; Southerland & Scharmann, 2013).
- Model respectful dialogue and provide examples of scientists who both hold religious beliefs and conduct evolution research (Barnes et al., 2017; Ferguson & Jensen, 2021).
- Position science and evolution as one way of knowing about the world that makes specific assumptions (e.g., science is tentative, empirical, and bounded) that differ from other ways of knowing such as religion (Moore, 1999).
- Avoid portraying evolution as inherently anti-religious, which can alienate students for whom religious identity is central.

For Institutions:

- Review departmental and institutional messaging to ensure it does not unintentionally alienate religious students.
- Support inclusive messaging and provide training for advisors to recognize when religious identity intersects with science decision-making.
- Offer workshops for students on navigating religious-career tensions and communicating their interests to family members who may hold strong religious views.
- Create resources that respect diverse worldviews and demonstrate that scientific engagement and religious faith are not necessarily mutually exclusive.

8.5 Engaging Families as Partners

For Faculty and Advisors:

- Equip students to explain evolution careers to family members by providing accessible materials (e.g., brochures, videos) that students can share with their families.
- Incorporate narrative and reflective advising tools that allow students to articulate their own career values while acknowledging familial influence (Reid & West, 2011; Stebleton, 2010).
- Validate communal goals (e.g., helping others, uplifting communities) as aligned with science careers, countering the perspective that science is emotionless, unethical, or amoral (Brem et al., 2003).

For Institutions:

- Host family-inclusive events such as open houses, online information sessions, and career nights that demystify evolutionary biology and build support from students' home communities.
- Develop culturally responsive advising models that recognize the central role of family in Black and African American students' career decision-making (Fouad et al., 2016; Koçak et al., 2021; Tuma et al., 2025; Vautero et al., 2021).
- Recognize and affirm the additional labor that students from historically excluded communities perform in bridging cultural gaps between academic and familial worlds.
- Create seminars or mentoring circles where students can explore career decision-making in the context of cultural and familial expectations.

8.6 Supporting Culturally Grounded Career Development

For Institutions:

- Develop curricula and advising practices that anticipate students may need to explain their academic interests to families unfamiliar with evolution-related careers.
- Support mentoring programs where students explore careers within the context of cultural expectations, connecting personal interests to familial and communal values.
- Foster environments where students can develop integrated identities that encompass both their scientific aspirations and their cultural and religious commitments.
- Provide professional development for faculty and staff on culturally responsive pedagogy and advising, with specific attention to the

experiences of Black and African American students in STEM.

9. Limitations and Future Directions

The research synthesized in this review, while rich and nuanced, has several limitations that should inform future investigations. First, existing studies have focused primarily on students enrolled at large, public research universities in the northeastern United States. Geographic context may be particularly relevant when interpreting findings related to religion, as prior research documents regional differences in religious affiliation and engagement across the United States, with higher levels of religiosity observed in the South compared to the Northeast (Pew Research Center, 2025). Given that most of the U.S. Black population resides in the Southern United States, perceptions of religion as conflicting with academic or career pursuits may differ in regions where religious institutions play a more central cultural and community role (Pew Research Center, 2023).

Second, while recent studies have made significant progress in centering student voices, there remains a need for research that more fully explores the intersection of multiple identity dimensions—including cultural identity, socioeconomic status, immigration history, gender, and sexuality—with career decision-making in evolutionary biology. The heterogeneity documented in existing research suggests that a more nuanced understanding of how these factors interact would enhance the development of targeted interventions.

Third, longitudinal research is needed to track how students' career interests and perceptions evolve over time, from early undergraduate years through graduate school and early career stages. Understanding the trajectories of students who do and do not pursue evolutionary biology careers would provide valuable insights into the critical decision points and supports that facilitate or hinder pathway progression.

Fourth, intervention studies that test the efficacy of specific strategies—such as inclusive pedagogy, career awareness initiatives, family engagement programs, and mentorship models—are essential for moving from descriptive research to evidence-based practice. Randomized controlled trials and quasi-experimental designs could evaluate the impact of these interventions on students' career self-efficacy, outcome expectations, and actual career choices.

Finally, research should examine the experiences of Black and African American professionals who have successfully navigated careers in evolutionary biology. Their perspectives could illuminate the strategies, supports, and resilience factors that enable persistence despite systemic barriers, providing valuable models for aspiring students.

10. Conclusion

The underrepresentation of Black and African American individuals in evolutionary biology is a multifaceted problem rooted in historical, structural, and interpersonal factors that intersect to shape students' career decision-making. This review has synthesized recent qualitative research identifying three primary domains of influence: career compatibility (encompassing racial representation, historical context, religious identity, and personal interest), career knowledge (including awareness and perceptions of evolutionary biology careers), and family influence (covering expectations, support dynamics, and religious tensions).

The findings reveal that while many Black and African American undergraduates express genuine intellectual interest in evolution, significant barriers prevent this interest from translating into career consideration and pursuit. These barriers include the field's exclusionary history and ongoing lack of racial diversity, limited awareness of what evolution careers entail, perceived and actual conflicts between religious identity and evolutionary theory, and powerful familial expectations that prioritize more traditionally recognized and financially secure career paths.

Addressing these barriers requires comprehensive, sustained efforts at multiple levels. Institutions must actively acknowledge and work to transform the historical and ongoing impacts of racism in science. Faculty must integrate career awareness and inclusive pedagogy into their courses. Advisors must develop culturally responsive practices that recognize the central role of family and community in students' lives. And the field as a whole must expand its vision of what counts as evolutionary biology and who belongs within it.

The students whose voices animate this research are not merely potential entrants to a discipline that has excluded them; they are agents capable of reshaping evolutionary biology into a more inclusive, equitable, and socially responsible field. As one participant articulated, increased representation of Black and African American scientists in evolution could "combat...long standing...ideologies that aren't representative of reality" and "lower the amount of stigmatization that occurs" (Montañez et al., 2026). Realizing this vision requires that institutions and individuals currently in positions of power commit to dismantling barriers, amplifying marginalized voices, and creating conditions where all students can envision themselves as rightful members of the scientific community.

The path forward demands not incremental change but transformational reform—reform that addresses the root causes of underrepresentation rather than merely its symptoms. By centering the experiences and perspectives of Black and African American students, by engaging their families and communities as partners, and by committing to the hard work of institutional and cultural

change, evolutionary biology can become a discipline that truly reflects the diversity of life it studies and the society it serves.

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