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Science Communication

Tasting the Tree of Life: Development of a Collaborative, Cross-Campus, Science Outreach Meal Event

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Communicating about science with the public can present a number of challenges, from participation to engagement to impact. In an effort to broadly communicate messages regarding biodiversity, evolution, and tree-thinking with the campus community at The College of New Jersey (TCNJ), a public, primarily undergraduate institution, we created a campus-wide, science-themed meal, "Tasting the Tree of Life: Exploring Biodiversity through Cuisine." We created nine meals that incorporated 149 species/ingredients across the Tree of Life. Each meal illustrated a scientific message communicated through interactions with undergraduate biology students, informational signs, and an interactive website. To promote tree-thinking, we reconstructed a phylogeny of all 149 ingredients. In total, 3,262 people attended the meal, and evaluations indicated that participants left with greater appreciation for the biodiversity and evolutionary relatedness of their food. A keynote lecture and a coordinated social media campaign enhanced the scientific messages, and media coverage extended the reach of this event. "Tasting the Tree of Life" highlights the potential of cuisine as a valuable science communication tool.

INTRODUCTION

Interest in science communication and outreach is booming, with social media and large-scale citizen-science projects allowing scientists to interact with astounding numbers of nonscientists. These efforts have benefited from the emergence of science communication as a discipline of study, leading to a better understanding of the public that scientists are trying to reach, as well as the most effective approaches (1). A major step forward has been movement away from the "deficit model" of engagement, which had posited that the public a) suffers from science illiteracy, and b) is misinformed about science by the media; the model led scientists to attempt to remedy this with outreach efforts aimed at the one-way transmission of knowledge (2–4). Rather, studies continue to reinforce the findings that participatory and experiential engagement models have more impact than do mere facts on an individual's attitudes, which, in turn, may have more impact on behavior and decisions (4).

Still, outreach efforts housed in academic institutions, museums, on the Internet, and on social media tend to reach a narrow, self-selected population of science enthusiasts. However, outreach efforts have begun to move to more informal settings (2, 4). Examples include science cafés, outreach at music festivals, photo displays in public spaces, and arts-based science initiatives (3, 5–8). When the public does not expect to encounter science in these settings, incidental exposure to science by individuals who would not ordinarily seek out such science experiences then becomes more likely, significantly broadening public participation and engagement (3, 7, 8).

While not everyone seeks out information about biodiversity and evolution, everyone needs to eat. With this in mind, in spring 2017 we held a public outreach event titled "Tasting the Tree of Life: Exploring Biodiversity through Cuisine" (http://tastingtreeoflife.pages.tcnj.edu/). This event engaged students, faculty, staff, and external guests across the population of a public, primarily undergraduate institution—The College of New Jersey (TCNJ)—home to nearly 6,500 students. During lunch and dinner on one day, the main dining hall was transformed so diners could

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explore biodiversity, evolution, and phylogeny by experiencing these concepts through a meal, keynote lecture, interactions with biology majors, informational signs, and an interactive website. "Tasting the Tree of Life" was modeled on an existing framework for themed meals. In 2012, students and faculty in the School of Science collaborated with TCNJ Dining Services for the first campus-wide themed meal, "Compounds & Cuisine: The Science of What You're Eating" (9). This event, the largest molecular gastronomy meal in the country, exposed participants to the direct link between science and food.

We focused on the Tree of Life for the second science-themed meal at TCNJ. For centuries, humans have used tree-like diagrams to organize and communicate ideas about the relationships of life on Earth. Starting with Darwin, trees began to depict evolutionary relationships by representing relatedness based on common ancestry (10). Today, the ability of biology students to properly interpret trees and use them in the study of evolution and biodiversity (tree-thinking) is viewed as a fundamental component of their education (note that "tree-thinking" does not include the ability to reconstruct trees) (11–13). Despite this, there have been many well documented difficulties and misconceptions with tree-thinking, including ladder thinking, node counting, evolving perfection, and synonymizing similarity and relatedness (13–16). Trees are central to understanding everyday issues faced by the general public, such as disease outbreaks (17–19) and the effects of climate change on Earth's biodiversity (20). Recently, the first draft of the Tree of Life including 2.3 million species (21) jumped from the pages of peer-reviewed journals to the widely read science section of the *New York Times* (22). Museums increasingly incorporate trees into their evolution and biodiversity exhibits and are grappling with determining best practices of communicating information in the form of trees (23–25).

Following best practices in science communication (2, 4), we viewed the opportunity to discuss macroevolution, tree-thinking, and biodiversity in the context of an issue the public values—food—as a way to engage a diverse audience and prompt them to consider how these concepts impact a vital and frequent human practice—eating. In "Tasting the Tree of Life," we used backward design and active, experiential learning approaches with cuisine as the vehicle to facilitate public exploration of complex scientific concepts. This approach is scalable and adaptable to diverse venues and messages.

METHODS

Event design process

The team that planned "Tasting the Tree of Life" included Biology faculty members, the Dean of the School of Science, undergraduate Biology majors, and members of Dining Services (Table 1). We used a backward design framework to plan this event, first developing five experiential learning

TABLE 1.
Contributions of over 70 people to the development, implementation, and assessment of "Tasting the Tree of Life."

Contributors	Faculty	Administrators	Students	Dining Services	Media Relations	Web Design	Graphic Designers & Artist	Social Scientist
Event design								
Initial brainstorming	X	X	X	X				
Identification of event goals	X	X	X					
Identification of scientific messages	X	X	X					
Meal planning	X	X	X	X				
Creation of a visual identity for the event	X	X	X	X		X	X	
Event implementation and communication								
Advertising of the event	X	X	X	X	X	X	X	
Participant training	X		X					
Communication of scientific messages	X	X	X	X	X	X		
Physical transformation of space	X	X	X	X				
Assessment	X	X	X	X	X			X

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goals, as well as assessments and activities aligned with those goals (Fig. 1).

The planning team met regularly over nine months. These meetings were highly collaborative and highly iterative. Early topics included the experiential learning goals, the number of meal stations, a primer on macroevolution and tree-thinking, and a general framework for the event. The scientific messages were developed, along with the menu for a meal corresponding to each message. To highlight biodiversity within the meals, the biologists asked for foods from as many phylogenetic groups as possible and provided the Executive Chef with an extensive list of possible food ingredients organized by evolutionary classification. Our chef designed this menu while also adhering to the diverse needs of diners, such as avoiding common allergens (e.g., peanuts and tree nuts) and providing options for additional dietary needs (e.g., vegetarian, vegan, gluten-free). The full menu for "Tasting the Tree of Life" is available at https://tastingtreeoflife.pages.tcnj.edu/tree-of-life-menu/meals-by-theme/.

As the menu took shape, the faculty and students developed essays on the scientific concepts behind each meal. The essays were posted on the event website along with resource lists so that interested participants could pursue these topics further. Informational posters were designed to be stationed adjacent to each meal (Fig. 1).

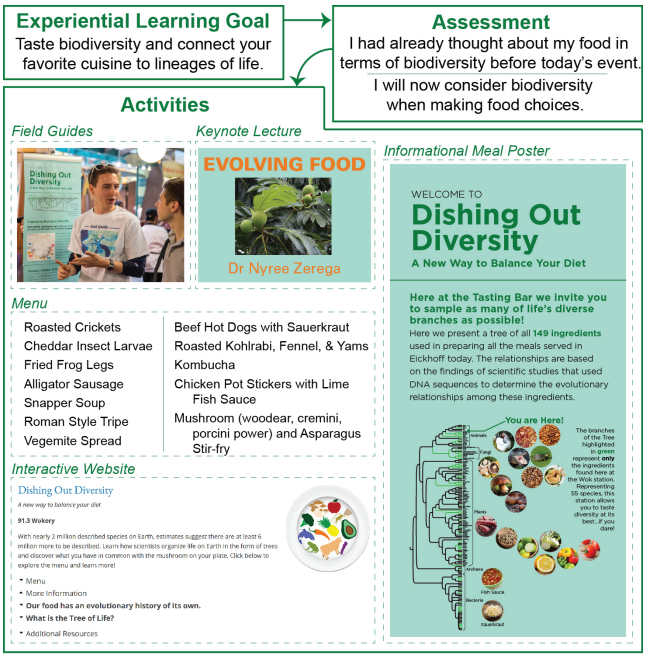

FIGURE 1. Backward design process for "Tasting the Tree of Life." This diagram depicts how one experiential learning goal was realized through materials associated with a single meal station, Dishing out Diversity. Paired survey questions were designed to measure the achievement of the goal (Fig. 3). Activities included discussions with biology majors who acted as field guides, a keynote lecture, the diverse menu at the meal station, informational posters, and essays and additional resources posted on the event website (http://tastingtreeoflife.pages.tcnj.edu/).

Each poster described the take-home messages of the meal, included a highlighted ingredient tree (explained below), and showcased an illustrative example of the scientific concept for that meal.

Reconstructing a phylogeny of ingredients

A key aim was to communicate tree-thinking to a broad, nonspecialist audience. To help facilitate messages about evolutionary relatedness and food diversity from an evolutionary perspective, we reconstructed a phylogenetic tree that included all 149 ingredients/taxa found in the menu, and we placed humans on the tree as a point of reference (https://tastingtreeoflife.pages.tcnj.edu/interactive-tree/). As the ingredients spanned all major branches of the Tree of Life, we used Mesquite version 3.10 (26) to reconstruct the relationships of the tree by hand, using published trees based on reconstructions from molecular sequence data (21, 27, 28, the Angiosperm phylogeny website www.mobot.org/MOBOT/research/APweb/, The Tree of Life web project http://tolweb.org). Additionally, we created a small tree of common foods to introduce tree-thinking to participants by relating a phylogenetic tree to a family genealogy; we discussed how you could "see" the diversity on your plate by comparing trees with branches of ingredients/taxa in each meal highlighted in different colors. This introduction was featured consistently across many messaging platforms: our website, a large poster displayed in the dining hall during the event, a pamphlet given to each attendee as they entered the dining hall, and a decorative wrap-around that covered the centerpiece vases on each table in the dining hall.

Communication and advertising

Members of the planning team initiated collaborations with TCNJ's Office of Communications, Marketing, and Brand Management to develop the main graphics for the event (Fig. 2A) and the website (Fig. 2C); this was a highly iterative process with input from the scientific team. We then used this graphic in promotional materials including posters and images for various social media applications, and on the event website. At the suggestion of our students, we also developed a SnapChat geofilter in which we created a layer containing our main graphic (Fig. 2A) that could be added to photographs that students took during the event. Photographs posted to social media with the layer were visible to all, but the filter itself was only available when in the dining hall (thus, geofilter). The main graphic and SnapChat geofilter helped to generate significant interest on the day of our event. The event website was custom designed by an undergraduate computer science major. Thirty-seven undergraduate Biology students volunteered to serve as "field guides," or subject experts, interacting one-on-one with participants during the meal. Field guides participated in a one-hour training session that employed active-learning strategies to prepare them for these interactions.

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Implementation and dissemination

"Tasting the Tree of Life" was advertised to the campus community via posters, digital signage, and postcards sent to all faculty and many staff mailboxes, and the event was featured on the TCNJ home page. All publicity incorporated the main graphic for the event (Fig. 2A) and linked to the website. The event was also publicized via a coordinated social media campaign and campus-wide emails.

On the day of "Tasting the Tree of Life," the dining hall was physically transformed. Placards, posters, banners, and tablecloths throughout the space were color-coordinated with the main event graphic. Centerpieces—mason jars wrapped in a brown bark pattern and containing green flowers to resemble trees—displayed the brief primer on phylogenetic trees and tree-thinking. Large banners challenging participants ("How bold are you?") were hung above the tasting stations. The students on the planning committee had designed clever stickers that were available at each station (Fig. 2B). Two large overview posters at the entrance introduced diners to the event and meals. When attendees entered the dining hall, student field guides greeted them and handed each participant (a) an event survey and (b) a pamphlet with a primer on tree-thinking, the experiential learning goals, and a map of the dining hall with the location of each meal.

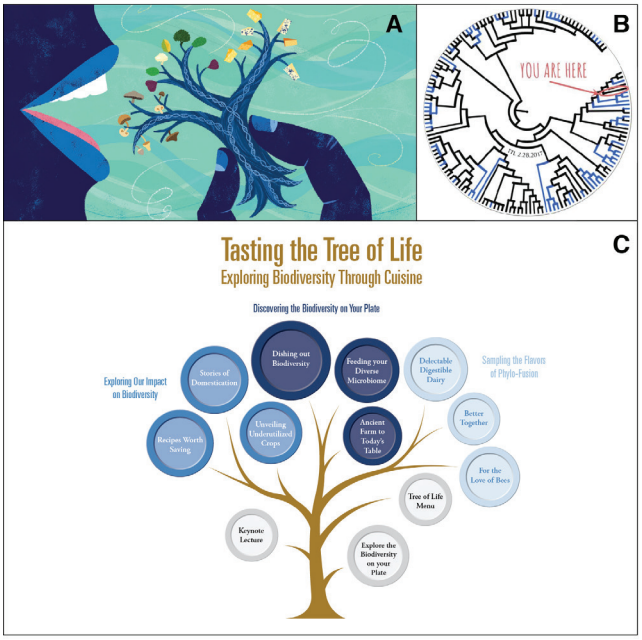

FIGURE 2. Key graphics designed for "Tasting the Tree of Life." A) This image of a gender- and race-neutral person eating a tree containing foods such as cheeses, jackfruit, and mushrooms was designed specifically for the event and served as the primary visual for the day. The image was included on all promotional and educational materials, as well as the main billboard image on the event website. B) This image of the phylogenetic tree containing all 149 ingredients/taxa included in the nine meals—with a branch representing humans added and indicated by "You are here!"—is one example of the many stickers designed by students and faculty for the event and for each meal. C) This image of a tree with plates at the branch tips was created for use on the event website. Each plate represents a meal, organized by the three overarching themes of the event (Table 3). On the website, each plate is a clickable image that takes the user to more information and resources about the meal.

Participants experienced the scientific themes in a variety of ways (Fig. 1). At each meal station, student field guides talked with participants about that meal's scientific theme. Field guides were easily identified by their T-shirts displaying the main event graphic. Large posters exploring the meal theme were placed at each station. The associated keynote lecture discussed many of the scientific themes of the event, and one specific meal (Unveiling Underutilized Crops) was designed to highlight the keynote speaker's research on jackfruit and breadfruit, both of which were served for the first time in the dining hall. Our collaborators in Media Relations invited a range of media to attend, leading to dissemination of our scientific messages to local and regional outlets in print, online, on radio, and on television (a comprehensive list of press coverage can be accessed at https://tastingtreeoflife.pages.tcnj.edu/press/). The event was also covered in national food service/food management print and online outlets, and the event was recognized with two food industry awards.

Assessment

To assess whether this event achieved our learning goals, we collaborated with a TCNJ social scientist to devise a set of survey questions. We chose three core ideas that intersected with multiple learning goals: food biodiversity, evolutionary relatedness between ingredients, and human impact on food biodiversity. We posed three pairs of questions to measure how frequently participants considered these ideas before the event and how frequently they would consider them moving forward. These questions were integrated into the anonymous survey tool that Dining Services customarily distributes to assess special events. Only those surveys with responses to both the before and after questions in a given pair were included in our analysis. Survey data were analyzed using the Wilcoxon test in IBM SPSS Statistics version 23. The College of New Jersey Dining Services tallied the number of participants who entered the dining hall for lunch and dinner. We obtained estimates of typical viewership and subscription levels for media outlets.

RESULTS

Interactive public engagement through a science-themed meal

Following a backward design approach (Fig. 1), five main learning goals were developed for "Tasting the Tree of Life" (Table 2). These were framed as *experiential* learning goals, as one might encounter in a museum or public exhibit, with the verbs of each goal emphasizing the role of the public

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TABLE 2.
Experiential learning goals and the meals that were designed to help participants realize these goals at "Tasting the Tree of Life."

Experiential Learning Goal	Discovering the Biodiversity on your Plate			Exploring our Impact on Biodiversity			Sampling the Flavors of Phylo-Fusion				
	DD	FDM	AFTT	UUC	SD	RWS	BT	FLB	DDD	ST	GT
Taste biodiversity and connect your favorite cuisine to lineages of life.	X	X	X	X	X	X	X	X	X	X	
Navigate the Tree of Life and the relationships among its branches through your meal.	X	X	X	X	X	X	X	X	X	X	
Learn about evolutionary processes that affect your diet.			X		X				X		
Observe how humans have impacted the biodiversity of food.			X	X	X	X		X			
Explore Tree of Life research ongoing at TCNJ.											X

DD = Dishing Out Diversity; FDM = Feeding Your Diverse Microbiome; AFTT = Ancient Farm To Today's Table; UUC = Unveiling Underutilized Crops; SD = Stories of Domestication; RWS = Recipes Worth Saving; BT = Better Together; FLB = For the Love of Bees; DDD = Delectable Digestible Dairy; ST = Salt Tasting; GT = Gallery of Trees; TCNJ = The College of New Jersey.

as active participants in the day's activities. For example, one experiential learning goal invited the public to "Taste biodiversity and connect your favorite cuisine to lineages of life." After discussing what participants would be able to do if we achieved these learning goals, we developed scientific themes and activities for the event aligned with those goals and assessments. Next, we mapped our experiential learning goals onto three major scientific themes: 1) Discovering the Biodiversity on Your Plate, 2) Exploring our Impact on Biodiversity, and 3) Sampling the Flavors of Phylo-Fusion (Table 3). Each of these three themes was then developed more deeply via three meals (nine meals total). For example, the theme Discovering the Biodiversity on Your Plate was explored at three meals, including a meal entitled Dishing out Diversity. This meal was served at a tasting bar, proposed by the Executive Chef, which became the centerpiece of the event and represented foods from 55 branches of the Tree of Life—everything from crickets and alligator to vegemite and Archaea.

Additional activities and resources were designed to help accomplish the experiential learning goals. In the Gallery of Trees, we displayed tree-like diagrams depicting relationships between organisms from pre- and post-Darwin eras. These were arranged chronologically concluding with modern molecular phylogenies and several from published works of TCNJ faculty and students. A natural salt-tasting station introduced diners to the Archaea. Dr. Nyree Zerega of the Chicago Botanic Garden and Northwestern University delivered a keynote lecture titled "Evolving Food: Food Biodiversity across the Tree of Life." The website developed for this event allowed Dr. Zerega to explore the meal and learning goals while preparing her talk. This enabled her to connect with our event goals during her lecture and preview many of the messages and ingredients waiting in the dining hall, including underutilized alternative crops—a focus of Dr. Zerega's research. The website not only allowed participants to preview the meal event and scientific messages, but also provided resources for participants seeking to explore these topics further after the event, and for individuals and institutions wishing to develop similar events. Website highlights included essays exploring the science of each meal, an interactive Tree of Life containing the ingredients of each meal, and additional resources for each scientific theme. Finally, diners explored the scientific messages both via informational posters linking their meal with scientific concepts and face-to-face conversations with undergraduate biology-student field guides.

In training sessions, we familiarized field guides with the experiential learning goals and scientific messages, and conducted an active-learning exercise in which students discussed pitfalls and strategies for drawing in members of the public and engaging them in one-on-one conversations about the science behind the day's activities. Although we did not formally assess the impact of the field guides, feedback from participants was nearly universal in citing these students as critical to the success of the event. Further, on a local-news television broadcast, one field guide shared one

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of the examples from the active-learning training exercise nearly verbatim, indicating that the training helped to shape the student's approach to public engagement.

Assessment

To determine how effectively the activities achieved the experiential learning goals, we distributed and collected a survey in the dining hall. This survey included questions about how frequently diners thought about three major concepts (biodiversity of their food, relatedness of their foods, and human impact on biodiversity of food) before and after the event. Approximately 250 participants responded to each pair of questions. For all three of the question pairs, respondents indicated a shift toward thinking about these concepts more frequently after the event (Fig. 3, $p < 0.05$).

To assess the impact of this event on our campus and beyond, we counted the number of participants and esti-

TABLE 3.
The three overarching scientific messages for "Tasting the Tree of Life," with sub-messages and general descriptions.

Discovering the Biodiversity on Your Plate	
Dishing out Diversity: A new way to balance your diet	With nearly 2 million described species on Earth, estimates suggest there are at least 6 million more to be described. Learn how scientists organize life on Earth in the form of trees and discover what you have in common with the mushroom on your plate.
Feeding your Diverse Microbiome: How diet affects the bacteria within you	50% of the cells in your body and 99% of the genes in your gut are actually from microbes—single celled organisms including bacteria, viruses, and archaea. These tiny organisms make up your microbiome, and what you eat affects your microbiome.
Ancient Farm to Today's Table: Unearthing the geographical origins of a meal	We often think of tomatoes as a key ingredient in Italian cooking. Does that mean tomatoes are from Italy? While this region of the world may produce lots of tomatoes, their evolution actually tells a different story.
Introducing Archaea: The third domain of life	Scientists have long thought there were two major forms of life—bacteria and eukaryotes (cells with a nucleus like humans). But there is more! Within the past 30 years we have discovered Archaea—organisms that share similarities with both eukaryotes and bacteria. Visit this station and learn where we encounter Archaea in our food.
Exploring our Impact on Biodiversity	
Recipes Worth Saving: Preserving the genetic diversity of our food	When you look out on a perfectly planted row of Jersey sweet corn, these plants are almost genetically identical. However, on a global scale, there are many varieties of edible corn that are genetically distinct. Why is genetic diversity of our crops important? Learn why and how we are preserving crop diversity here in the United States while exploring our seed-filled menu.
Stories of Domestication: Human history of artificial selection to create foods	Humans have been producing food through agriculture for thousands of years. Through artificial selection, we have improved crops by selecting features of plants and animals that make them more beneficial to us. Learn how artificial selection and domestication has affected the diversity of some of the most common ingredients on our plates.
Unveiling Underutilized Crops: The benefit of studying the biology of all food	Today our agricultural industry is dominated by three crops—corn, wheat, and rice—while humans have domesticated upwards of 10,000 plants! Here we invite you to taste flavors of some not-so-common crops and learn about how biologists are studying the biology of crops that are becoming increasingly important in our global food economy.
Sampling the Flavors of Phylo-Fusion	
Better Together: Culinary delights from interacting branches of the Tree of Life	Some of our most unique flavors result from combining distant branches of the Tree of Life. At Better Together, learn about *all* the ingredients in cheese and pickles and salami. Then, taste the results of using biodiversity to guide pizza topping selections—you'll be sure to come back for a second slice!
For the Love of Bees: Sampling the fruit of pollination	Whether you're biting into an apple or chopping up a zucchini, you are preparing a fruit which grows on a plant as the result of pollination. For many plants, insects are important pollinators—bees alone are responsible for pollination of nearly 1/3 of the world's agricultural crops!
Delectable Digestible Dairy: How we gained a taste for lactose	Got milk…or lactaid? As children, most humans are able to digest milk without difficulty, but as we age, we begin to lose the ability to digest lactose, the main sugar in milk. However, this is no longer the case for a growing number of people. Learn more about this change in human evolution and explore the toppings—with and without lactose—available at Roscoe's Tacos.

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mated the approximate number of individuals exposed to the messaging of the day via various television, print, and online sources (Table 4). Direct participants in the keynote lecture and/or the themed meal exceeded 3,400. The event was covered on regional evening-news broadcasts, in local and college newspapers, and in alumni and food service newsletters and magazines. Combined, the event reached an estimated 938,600 individuals (Table 4).

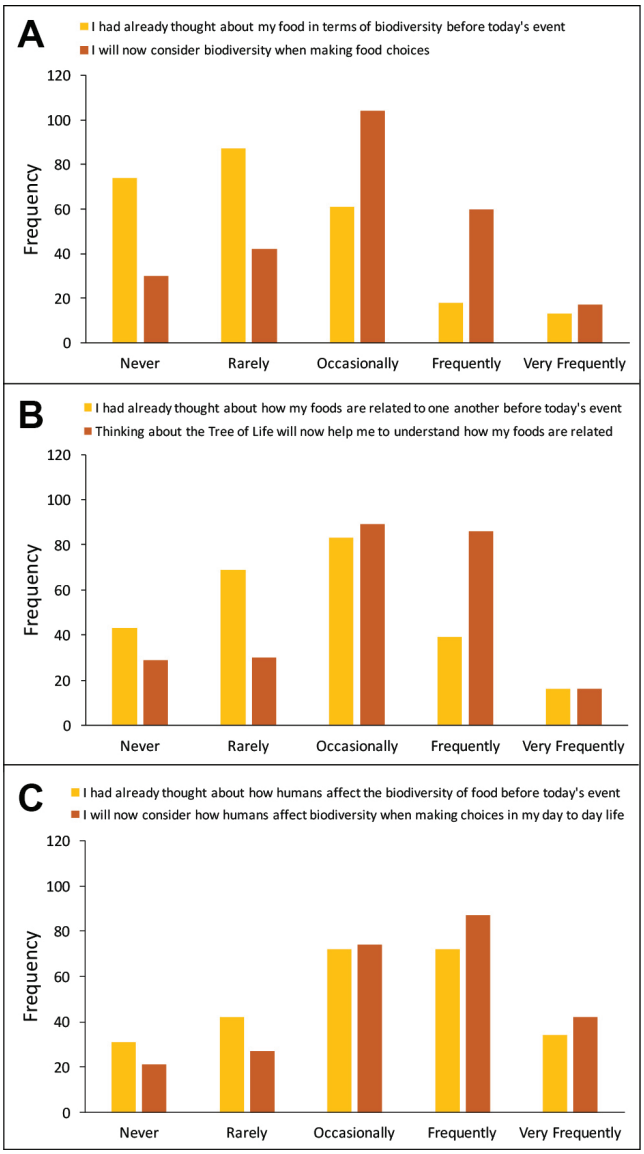

FIGURE 3. Impact on attitudes toward biodiversity and evolutionary relationships measured by an event survey. Participant responses to the question pairs above each panel were recorded on a five-point Likert scale. Total frequency of each response is indicated. Responses from participants who answered only one question in each pair were discarded. For each question pair, the Wilcoxon test indicated that the differences in before and after responses were statistically significant ($p < 0.05$). Question topics and sample sizes were as follows: A) Food Biodiversity, $n = 253$; B) Evolutionary Relatedness of Ingredients, $n = 250$; C) Human Impact on Food Biodiversity, $n = 251$.

DISCUSSION

Outreach activities that creatively engage the public in informal and unexpected venues allow scientists to reach broader audiences extending beyond science enthusiasts. Some of the most effective science communication approaches help the public to connect science to their daily lives (4, 6, 7). In "Tasting the Tree of Life," more than 3,400 participants engaged directly with concepts of biodiversity and evolution through food. In the age of the "foodie," cuisine represents a particularly powerful and underutilized vehicle for science communication.

Communicating biodiversity, evolution, and tree-thinking

"Tasting the Tree of Life" provided a platform for communicating ideas about biodiversity, evolution, and tree-thinking to a broad audience. These ideas are perhaps more commonly encountered in classrooms and natural history museums, where most participants likely have a pre-existing interest in science. We carefully considered the balance between our desire to communicate large ideas in science with the reality of needing to share short and well-illustrated sound bites with our participants without oversimplifying or reinforcing misconceptions. To this end, we avoided potentially controversial issues (e.g., genetically modified organisms, or GMOs) that might have distracted

TABLE 4.
Impact of outreach for "Tasting the Tree of Life."

On-Campus Event		Attendance
Meal		3,262
Keynote lecture		150
	Subtotal	*3,412*
Television News Segments		**Average Nightly Viewership**
6ABC		294,000
Fox 29		50,000
	Subtotal	*344,000*
Articles		**Print Subscriptions**
TCNJ Biology Newsletter		200
TCNJ Signal (student newspaper)		2,000
TCNJ Magazine		75,000
Food Management Monthly		47,000
Food Service Directors Magazine		50,000
Trenton Times/NJ.com[a]		417,000
	Subtotal	*591,200*
	Total	938,612

[a]Includes Twitter followers who received the story via tweet.

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from our main messages. Instead, we focused on examples that strongly connected to ingredients/taxa with which participants would be familiar, such as tomatoes. Commonly known as a key ingredient in Italian cuisine, tomatoes trace their evolutionary origins to the Andes of South America. We emphasized the importance of genetic diversity among crop plants and explored the impact of artificial selection on this diversity (Table 3). Meals also highlighted hidden microbial diversity in our foods. Finally, we connected humans to biodiversity and evolution by introducing the microbiome and discussing genetic changes underlying the emergence of lactose tolerance.

To help make phylogenetic trees accessible, visualization of trees followed best practices for public communication, including displaying the tree as rectangular instead of slanted or diagonal (23–25). Nodes were rotated so as to place humans in the middle of the tree, to counter the misconception that evolution has continuously progressed to the origin of humans. We designed the menu to include all three domains of life, enabling us to further messages about evolutionary relatedness. On the informational poster for each meal, the branches of the tree that represented the ingredients/taxa included in that meal were highlighted in one color. In this way, as participants moved from meal to meal, they could see at a glance how the pattern of colored branches changed (Fig. 4) and infer how the evolutionary diversity of their meal changed based on the ingredients/taxa used to prepare the dish. Although we were unable to address all common misconceptions in tree-thinking, our focus was to introduce trees and how they can help us organize and study diversity while downplaying misconceptions of similarity and relatedness and evolving perfection.

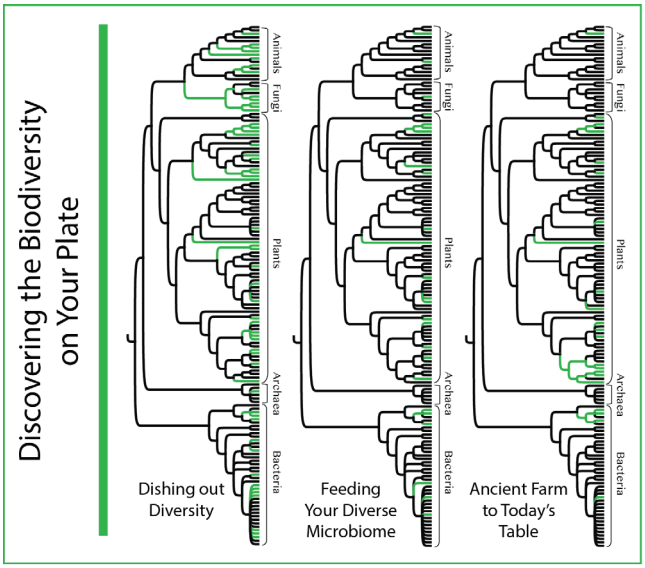

FIGURE 4. Highlighted ingredient trees for each of three meals. Each informational meal poster featured the ingredient tree with the branches included in that meal's menu highlighted in one color and the rest of the branches in black. By comparing these trees from meal station to meal station, participants could observe how the evolutionary relationships among their foods changed with each meal. Posters showing the collection of all meal trees were placed throughout the dining hall on the day of the event and are also included on the event website (https://tastingtreeoflife.pages.tcnj.edu/tree-of-life-menu/meals-by-tree/).

Impact of "Tasting the Tree of Life"

Our survey results indicate that this event achieved our experiential learning goals (Fig. 3). Participants were significantly more likely to think about their food in terms of biodiversity and about the relationships among their foods after this event. Gains in the likelihood that they would think about human impact on the biodiversity of food were significant, but smaller, as more participants indicated that they were already thinking about this frequently before their meal. We find it encouraging that our audience already possessed this awareness of human impact and suggest that they are primed for more in-depth dialogue on this issue.

Our Dining Services collaborators shared the messages and meals with others in their field. The event earned *Food Management* magazine's 2017 Best Concept Award for Best Special Event and an Honorable Mention from the National Association of College and University Food Services (NACUFS) for Residential Dining—Best Special Event in the 2017 NACUFS Loyal E. Horton Dining Awards. We broadened the audience for this event by collaborating closely with our institution's communications experts, who invited members of the local and regional media. Local broadcast news remains a significant source of information for large segments of the general public (2, 3, 29). By cultivating media attention, we extended the reach of this event to an estimated 935,000 additional individuals (Table 4).

There have been repeated calls for more science communication training, particularly at the undergraduate level (2–4, 30). Undergraduate biology majors who volunteered as field guides boosted their confidence in communicating with the public both via training sessions and through practical experience during the event. For the six biology majors who served on the planning committee, this experience represented a deep dive into science communication, with intensive, hands-on experience in outreach planning and execution.

Designing for impact

Several key factors helped to make this event successful. By holding this event at mealtime on a college campus, we engaged a "captive audience" comprised of individuals with diverse interests from across the campus community. Most diners eat, and therefore experienced this event, in groups, which others have found increases the effectiveness of outreach efforts (8). By implementing backward design, we also ensured that our goals were clearly articulated and well-aligned with our activities and assessments.

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Strong partnerships with stakeholders across campus allowed us to maximally leverage our resources and broaden the impact of the event. Involving undergraduate students throughout helped us to craft our messages in ways that more effectively reached their peers and increased buy-in. Early and consistent involvement of Dining Services helped us to keep our ideas feasible within their physical and contractual limitations, but also brought novel perspectives to the planning process. Collaborations with individuals working in communications and web development enabled us to broadcast our scientific messages online, in print, on radio, and on television. Our diverse collaborators also allowed us to test our messaging in advance with nonscientists.

This event benefited from two strong "hooks" that cultivated interest. The chef's suggested inclusion of crickets provided an exotic food that most people hadn't tried and was featured in most of the promotional materials and media headlines. In addition, the visually striking graphic developed for this event (Fig. 2A) generated significant "buzz." It is worth noting that this graphic was intentionally designed to be gender- and race-neutral, to help make the event as inclusive as possible.

Branching out

Science-themed meals represent an exciting new means of scientific communication. While "Tasting the Tree of Life" had a campus-wide scope at TCNJ, this kind of event could be scaled down and/or adapted to a variety of scientific messages. For similar events, we cannot stress enough the importance of a non-hierarchical, truly collaborative approach to planning with all stakeholders. Long-term planning is critical and should take semester breaks into account to ensure that students can be equally involved in all steps of the process. The College of New Jersey also recognizes this kind of outreach among a faculty member's service commitments and values such service in tenure and promotion processes, which helps to encourage faculty engagement.

Focusing on broad themes in scientific outreach events can allow scientists with narrower expertise to participate and share their subfields within a larger framework (6). In our case, a plant evolutionary biologist and a bacterial geneticist used this event to address several misconceptions specific to their subfields. To address plant blindness, we used a dessert station to discuss plant pollination and the need for plant–insect interactions to produce fruits such as apples, and we introduced plants uncommon to most participants but staple crops in other regions of the world (e.g., breadfruit). To address the misperception of microbes solely as harmful pathogens, meals highlighted the human microbiome as well as microbes in food production and fermentation. More examples of the messages associated with each of the meals of this event are available at https://tastingtreeoflife.pages.tcnj.edu/ under the Biodiversity Meal Themes menu. We encourage scientists who might not initially see a relationship between cuisine and their research to consider a broadly themed science meal and think creatively about connections with their field.

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