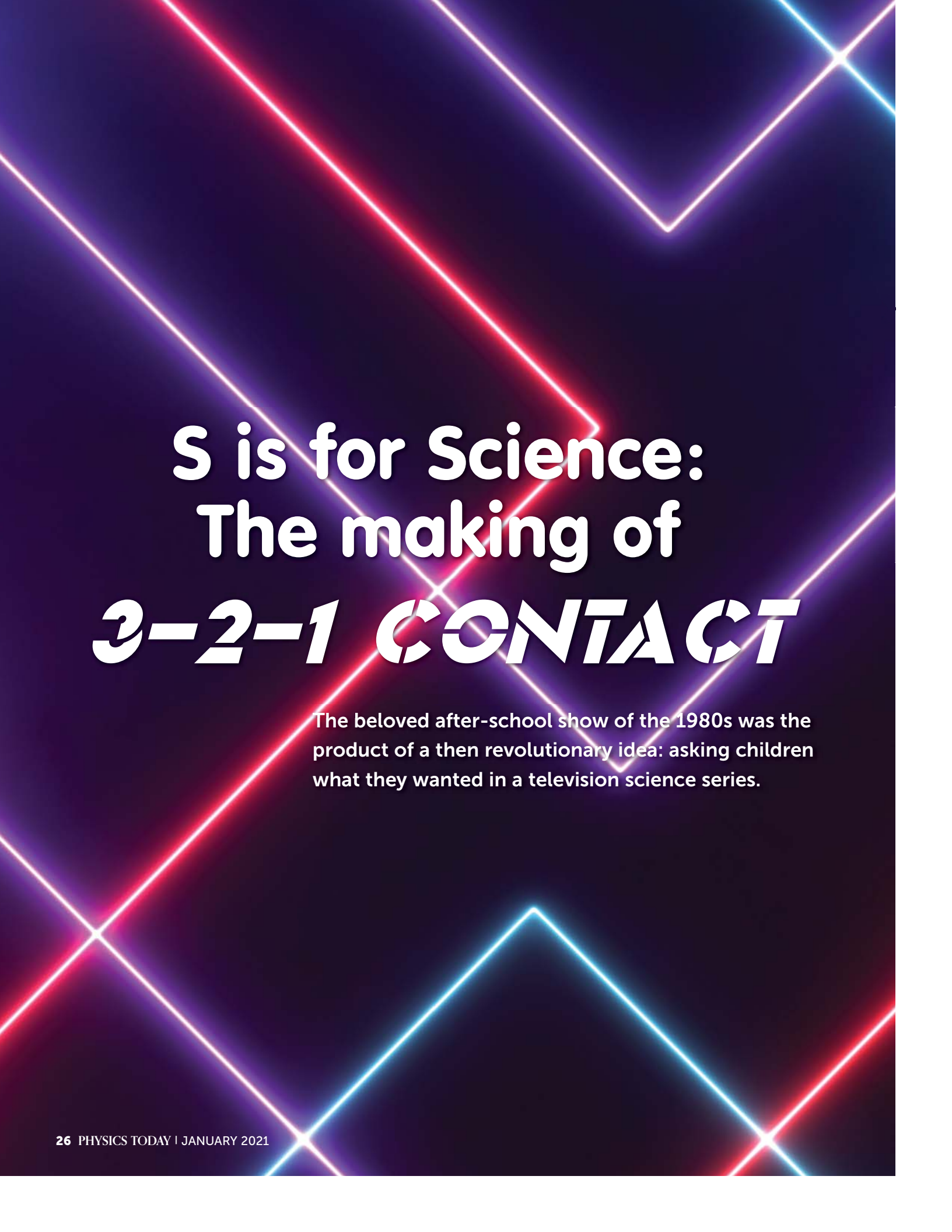




S is for Science: The making of *3-2-1 CONTACT*

The beloved after-school show of the 1980s was the product of a then revolutionary idea: asking children what they wanted in a television science series.



Ingrid Ockert

From *Elinor Wonders Why* to *Emily's Wonder Lab*, a multitude of fresh, dynamic programs have recently premiered that encourage children to channel their inner scientists. Between streaming services and television, today's young people have more access to quality science programming than ever. But before there was *Cyberchase*, *Wild Kratts*, *The Magic School Bus*, or even *Bill Nye the Science Guy*, there was the show that started it all: *3-2-1 Contact*.

Premiering in 1980, *3-2-1 Contact* aired on PBS (Public Broadcasting Service) stations across the US and quickly became a beloved classic of Gen Xers and Millennials. Although it was not the first science series for children—*Watch Mr. Wizard* had entertained young people in the 1950s and 1960s—it broke new ground in several ways. It was the first children's science series to receive funds from NSF. It was the first to intentionally reflect the diversity of its young audience by introducing viewers to scientists of different ethnic backgrounds. And unlike previous science programs, which presented kids with straightforward experiments, *3-2-1 Contact's* creators gave their show a freer format that combined skits, cartoons, and documentary shorts, grouped into loose themes. For example, one episode on the topic of "order and disorder" featured a visit to a sewage treatment plant, a skit about teamwork, and a quick lesson on programming computers. The show's writers had ample freedom to familiarize students with various scientific disciplines.

Many viewers have credited *3-2-1 Contact* with helping to spark their scientific career aspirations. In an article she wrote for *Science*, Ainissa Ramirez, an engineer and science communicator, fondly recalled the series: "I have wanted to be a scientist ever since I was a little girl. I got the idea from a television program called *3-2-1 Contact*, where I watched a young African-American girl solve problems. I saw my reflection in her and was transfixed."¹ That effect wasn't an accident. The creators of *3-2-1 Contact* were determined to use their show to inspire a new generation of scientists. What was their secret? Science.

Strikingly, *3-2-1 Contact* was the first science television series to be designed by scientific study. The show's content and dynamic style were informed by two years of focus groups and audience evaluations. A close look into the origins of

3-2-1 Contact offers a fascinating case study into the ways that scientists, researchers, and broadcasters can collaborate on educational projects to reach and inspire viewers.

Meet the Mod Squad

The innovative *3-2-1 Contact* was a product of the Children's Television Workshop (CTW, now the Sesame Workshop), the nonprofit production

company that had created *Sesame Street* and *The Electric Company*. The CTW was founded in 1968 by producer Joan Ganz Cooney and a handful of other creative professionals who hoped to develop a new type of educational programming for American children. *Sesame Street*, with its colorful puppets and humans living together in a New York City neighborhood, premiered in 1969, and by 1972 it was watched by 80% of all preschoolers in the US.² But *Sesame Street* isn't just one of the most popular children's shows of all time; it was the first to be based on scientific research.

Breaking new ground, the CTW hired a full research staff.³ Every television series the organization produced had its own research team that assessed the show's intended audience and determined the viewers' wants and needs. Cooney later recounted how her colleagues ridiculed her belief in sociological research. "'Researchers helping producers design a show? You must be kidding!'" she recalled being told by "practically everyone in TV willing to give an honest opinion."⁴ The established television dogma held at the time that a successful show depended on the intuition of an experienced staff, not the facts and figures of audience surveys.

But the 1970s saw a flurry of new sociological studies about children and television. For the first time, social scientists started to observe children in classrooms, not laboratories. They began asking how television viewing affected children's views of society. Science helped producers like Cooney prove that badly scripted shows could damage children's worldviews, and prosocial programming could help children form more positive ideas about their environment.

The CTW's research department became the company's secret weapon in the battle to design wholesome educational



FIGURE 1. BRAINSTORMING THE IDEAS that would grow into *3-2-1 Contact* were students from Harvard University's Graduate School of Education, shown here in 1975, on the left. Several members of the class went to work on the show's research and production teams. On the right, Keith Mielke, Barbara Myerson Katz, and Milton Chen, three of the four research staff involved in the program's development, are shown together in 2005. (Photos courtesy of Barbara Myerson Katz.)

content for young minds. Shows were designed based on an informed feedback loop between writers, researchers, and directors. As a program was produced, department staff would test it in classrooms for appeal and comprehension by using a system of interviews and questionnaires. If children disliked a particular character, for instance, the writers would be notified, and the character might be rewritten or recast. Only when the show garnered the audience's approval would it be aired on national television.

In the early 1970s, buoyed by the success of *Sesame Street* and *The Electric Company*, Cooney tasked her researchers with a new challenge: to create a television series that would inspire children to become scientists. Over the next four years, several CTW producers brainstormed ideas for a "curiosity show" with students at Harvard University's Graduate School of Education, shown in figure 1 on the left. Their ideas became the seeds of a new science series.

The three research associates who worked to develop the new show were Milton Chen, Hylda Clarke, and Barbara Myerson Katz. Chen and Myerson Katz had studied at Harvard's Graduate School of Education, and Clarke held advanced degrees in psychology. Additionally, Chen focused on communications research and later pursued a doctorate at Stanford University. The three researchers worked on the third floor of the CTW office building in Manhattan, but they spent a lot of their time traveling to different elementary school classrooms, YMCAs, and community centers in the New York City area. As a diverse team (Chen is Chinese American, Clarke is African American, and Myerson Katz is Jewish), they dubbed themselves "the Mod Squad of research," a reference to the popular television show about a multiethnic trio of police officers. They worked under the CTW's head of research, Keith Mielke (shown on the right in figure 1 with Myerson Katz and Chen), a former university professor who

proved a generous mentor for the young researchers.

The CTW was an exciting place for young creative professionals in the 1970s. Researchers and writers would frequently be hired on a temporary basis and then become permanent staff members as positions opened up. Although each CTW show had its own research team, members of different teams often met for lunch and strolled together through Central Park. The research staff spent long nights together tabulating data and graphing assessments by hand.

In 1977 Chen, Clarke, and Myerson Katz began designing studies to assess children's preexisting attitudes about science and how they were shaped by films and TV shows. They even had at their disposal a new interactive technology called the Program Evaluation Analysis Computer, a system of individual remotes that children could use to register their likes and dislikes and send them to a central console.⁵ The researchers could then view the data within minutes on a computer monitor—a step up from hand tabulation!

That summer, the cinema release of *Star Wars* captivated the CTW's core audience. Myerson Katz remembers the first time she heard about the movie: She, Mielke, and Chen were walking down Broadway when they spotted a striking billboard advertising it. "Keith pointed to the sign," she recalls, "and said, 'That's what we're competing against. We have to get the attention of an audience that's going to see that in the movies.'" The CTW, which lacked the budget for talking robots and fast-moving spaceships, had to convince children that real science could be just as cool as the Force.

The squad in action

One of Chen, Clarke, and Myerson Katz's first studies gathered qualitative data on children's bias toward scientists. Two hundred children in grades 4–6 at an elementary school in western New York were asked to write essays either describing the reasons why they might want to be a scientist or imagining the average day in the life of a scientist.

Discouragingly, boys and girls alike overwhelmingly believed that science was an intellectually exhausting, dangerous, and demanding career. Their perceptions reflected the way scientists were portrayed in movies and cartoons: as older men wearing white lab coats, hunched over their laboratory equipment. Most saw scientists as "very narrow human beings who spend their lives in labs and have little social interaction." One

boy wrote, “I would not like to be a scientist because I would not like to do what they do. They get up early in the morning.” The children understood the importance of scientific research—and some expressed an interest in learning about the human body—but they didn’t feel comfortable imagining themselves as future scientists.

The team’s magnum opus, “The Television Interest Survey,”⁶ came in 1978. More than 4000 children in five states completed the survey, which asked their opinions on a range of popular television programs, including *The Six Million Dollar Man*, *The Muppet Show*, and *ZOOM*. The researchers hoped that the selection of states—Massachusetts, Mississippi, Virginia, Illinois, and California—would encompass not only geographic but also ethnic and economic diversity. To make the questionnaire as accessible as possible, they designed it to be completed in just 20 minutes, with minimal literacy required. The study confirmed what the researchers had long suspected: Current television programs were not meeting the needs of scientifically minded children.

Commercial stations featured a few documentary programs about wildlife, and they were popular. Almost 90% of the survey participants were avid viewers of *Wild Kingdom*, a nature series on NBC. Children also reported watching the technicolor series *The Undersea World of Jacques Cousteau*.

But for children with budding interests in engineering, physics, chemistry, or astronomy, there weren’t a lot of television options. In 1978 PBS had been around for less than a decade, and its producers had largely focused on arts and culture programs. *NOVA*, the only nationally aired PBS program that featured scientists at all, was billed as a show “for curious grown-ups.” Understandably, then, only 30% of the children surveyed reported having even heard of it.

Unfortunately, the content gap in astronomy and other physical sciences was partially filled by the pseudoscientific show *In Search Of*. Hosted by former *Star Trek* actor Leonard Nimoy, *In Search Of* covered tantalizing subjects such as UFOs, psychic plants, and Bigfoot. The show was quite popular: Two thirds of boys and around half of girls surveyed reported watching it. But the show’s entertaining approach conflated fact and fiction, much to the dismay of science educators and researchers.

Overall, girls and boys reported watching different genres of programs. Many more boys than girls watched science and science fiction shows. Girls, on the other hand, enjoyed scripted shows that centered on female characters and the importance of community, such as *Little House on the Prairie* and—surprisingly—*Charlie’s Angels*, a show aimed at teenage boys. But girls told the researchers that they loved how the Angels solved puzzles and showed confidence. Young girls, it seemed, were looking for role models on television. For a science show to attract girls, it would need to feature strong female cast members solving challenges. Furthermore, noting that Latino and Black viewers reported en-



FIGURE 2. HOSTING THE FIRST SEASON of *3-2-1 Contact* were Lisa (Liz Moses), Marc (Leon W. Grant), and Trini (Ginny Ortiz). In a series of segments shot individually on location and together in their studio clubhouse, the three presenters showed the many ways that science is part of everyday life. (Photo © PBS/Courtesy of the Everett Collection.)

joying shows featuring same-ethnic-group actors, the researchers suggested the potential appeal of an ethnically diverse cast.

Additional, separate studies conducted by the team confirmed that both boys and girls seemed to like shows with dramatic narratives. Children were also intrigued by action-filled footage, such as oil spills and exploding volcanoes. Documentaries with strong visuals and clear narration could hold their attention.

But the characters and action needed to be realistic. Surprisingly, a television short featuring science fiction hadn’t fared well in CTW’s classroom tests. “While *Star Wars* was extremely popular,” the researchers noted, “the phony appearance of a space station and its cast in another program was rejected by kids.” Children were a fickle audience; they were eager for new



FIGURE 3. DIZZY GILLESPIE showed off his jazz skills in the 3-2-1 *Contact* clubhouse during an episode on noisy and quiet sounds. (Photo © PBS/Courtesy of the Everett Collection.)

material but picky about production quality. As the researchers summarized, "This audience is quite sophisticated in their television viewing and relatively unsophisticated in their scientific knowledge, which is what makes them a fascinating and challenging audience for this series."

Researchers in the writers' room

As the writers collected and developed ideas for the new show, Chen, Clarke, and Myerson Katz continued to have seats at the table. They were joined by several more scientific advisers; early in the process, Cooney had recruited a wide variety of well-regarded science educators and professors to join 3-2-1 *Contact's* advisory committee. Charles Walcott, a biologist from the State University of New York at Stony Brook who had been involved with the first season of *NOVA*, served as the scientific content director of the series. MIT physicist Philip Morrison and his wife Phylis Morrison, a science educator, urged the writers to focus on how science was a part of a child's daily ex-

perience beyond the classroom. Sheldon White, a psychologist at Harvard, suggested that the show could give children the conceptual tools to recognize patterns in their own lives. He proposed organizing episodes around simple binaries, such as "hot and cold" and "big and little," rather than conventional scientific disciplines. That thematic structure became the foundation to 3-2-1 *Contact's* novel approach.

The next conceptual building block was Chen's idea. He proposed dividing the show between two settings: A TV studio home base and a roving remote unit that would provide daily documentary pieces. Segments in both settings would be presented by actors between 20 and 30 years old, whom Chen imagined would be like the docents in a science museum: "Their main purpose is to make everything on the show as clear as possible to viewers. . . . They are not professional scientists but are intensely curious and serve as role models. For now, imagine them as Lindsay Wagner [*The Bionic Woman*], Clifton Davis [*That's My Mama*], or Ron McNair [one of NASA's first Black astronauts]."⁷ Young viewers wanted to see youthful, hip students, the team concluded, not space warriors or cutesy Muppets. The show's realism would set it apart from other children's television programs.

Gradually, the structure of 3-2-1 *Contact* took shape. The show's three main characters—Marc, a Black man; Lisa, a white woman; and Trini, a Latina woman, shown in figure 2—would take turns traveling to locations such as laboratories, volcanoes, and the ocean. In between those documentary shorts, they'd hang out in their clubhouse to discuss what they'd learned. The clubhouse setting was the show's connective tissue and provided viewers with a relatable, on-screen community.

With that premise in place, some of the show's consultants and writers wondered about other ways to make the series "cool." With the popularity of *Mork & Mindy* and its zany star in mind, they thought about finding a host with similar appeal.

Perhaps a teen idol such as Shaun Cassidy? Or Alan Alda, the star of *M*A*S*H*? For a while, they joked about approaching Henry Winkler, "the Fonz" from *Happy Days*.

But research had shown that children wanted multifaceted scientific role models, not talking heads. So instead of hiring one main celebrity, the producers decided to sprinkle cameo appearances throughout the show. Tennis pro Arthur Ashe appeared in one segment to talk with Marc about the mechanics of his sport. Dizzy Gillespie, shown in figure 3, and the members of KISS were featured in episodes about sounds. Most of the first season's guests, however, were plucked from scientific and everyday life: graduate students, university professors, a surfer, a race-car driver, a veterinarian, and the *Guinness Book of World Records* record holder for making the world's largest pizza.

With its eclectic mix of guests, 3-2-1 *Contact* projected the idea that anyone could be a scientist. The show never lost sight of its commitment to racial and ethnic diversity. In one episode, Marc was building a model of the solar system and

wanted to learn more about the Sun. So he invited Joseph Martinez, a Mexican American physicist from the Department of Energy, to visit the clubhouse and talk about the physics of light. Martinez and the gang sat down on beanbag chairs, and the conversation soon turned from science to his career path. After listening to Martinez recount how he'd gotten his start in science, Trini asked him why there were so few Hispanic scientists. Martinez explained that Mexican American children didn't have many role models in the sciences and didn't know that they could be scientists. Further, he explained, some teachers falsely believed that their Spanish-speaking students couldn't excel in science. The hosts expressed their disappointment. "It shouldn't really make any difference," replied Lisa, "because science is science, and the Moon affects everyone on Earth, no matter what language you speak."

Contacting a new generation of viewers

In late 1979, after three years of production led by executive producer Kathy Mendoza, *3-2-1 Contact* was approaching its final form. All the CTW staff were pleased with the first season of episodes, written by physicist Ted Ducas and science writer Boyce Rensberger. At the last minute, Sid Fleischman, the Newbery Medal-winning author of *The Whipping Boy*, was hired to write a detective serial to be aired as a "show within a show" on the series. The result, *The Bloodhound Gang*, featured a trio of crime-solving kids foiling the plots of a revolving cast of zany villains. The stars of the segment, shown in figure 4, were as diverse as those of the main series.

When *3-2-1 Contact* premiered on 14 January 1980, one reviewer called it "zippy, hip, and the kind of show that would interest adults as well as 8- to 12-year-olds." During its premiere run, Nielsen estimated that the show had been viewed by 23% of all children between the ages of 6 and 11. The research team's follow-up studies indicated that many children who'd watched the program felt more positively about science—and were more likely to agree that women could be scientists and that scientists were normal people. Some of the show's young viewers, such as Ainissa Ramirez, would go on to pursue science as a career. Just as the CTW researchers had hoped, African American and Hispanic children saw themselves reflected in the characters of *3-2-1 Contact*.

Chen was promoted to the CTW's director of research and oversaw the studies that guided *3-2-1 Contact's* subsequent seasons. For the first season, the

3-2-1 Contact research team had designed more than 50 studies and surveyed 10 000 children. For the second season, which aired in 1983, Chen led his team in generating 60 additional reports. That season was even more successful, reaching almost 40% of school-age children. To accompany the series, the CTW published a popular companion magazine, featuring games, activities, and articles about science, that saw a yearly circulation of 300 000 copies. The Girl Scouts partnered with the CTW to produce a series of *3-2-1 Contact* merit badges that rewarded girls for watching the program and completing activities inspired by particular episodes. In the Washington, DC, area alone, almost 10 000 of the badges were awarded.

New seasons of *3-2-1 Contact* continued until 1988, with several changes in actors and format along the way. The show's success encouraged the NSF program officers to fund more children's television series, including *Bill Nye the Science Guy* (1993) and *The Magic School Bus* (1994). Samuel Gibbon Jr, one of the leading visionaries of *3-2-1 Contact*, was inspired to create a narrative-driven science series, *The Voyage of the Mimi*



FIGURE 4. THE BLOODHOUND GANG—Zach (Kelly Pease), Ricardo (Marcelino Sánchez), and Vikki (Nan-Lynn Nelson)—starred in scripted segments that rounded out most *3-2-1 Contact* episodes. The trio of young sleuths used principles of logic and observation to bring wrongdoers to justice. (Photo © PBS/Courtesy of the Everett Collection.)

3-2-1 CONTACT

(1984), which followed the adventures of children on a marine biology expedition. (That series, incidentally, marked Ben Affleck's television debut.) In the mold of *3-2-1 Contact*, the CTW-produced *Square One Television* (1987) featured an eclectic assortment of sketches about mathematics. George Tressel, the former head of NSF's Public Understanding of Science program, credited *3-2-1 Contact* with laying the foundation for many of the organization's informal science education initiatives in the 1980s. (See the article by George Tressel, *PHYSICS TODAY*, November 1990, page 24.)

The success of *3-2-1 Contact* proved the value of formative research studies in television production. No previous television program had thoughtfully asked its audience, "What sort of science would you like to watch on TV?" The CTW embraced the unusual perspective that collecting audience data would help to create a better series. Today, creators of many children's science shows conduct similar research to evaluate their programming. Producers like Cooney showed their colleagues that scientists could be trusted members of production teams.

But *3-2-1 Contact* also demonstrated something much more important. It was the first science television series to take diversity seriously. Recognizing the need for children to see diversity reflected in scientific and technological fields, the *3-2-1 Contact* researchers, writers, and actors intentionally created inclusive narratives of science. The CTW listened to the voices of underrepresented children and invited them to dream about

their own future in science. The ultimate message was that science is for everyone—especially viewers like you.

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