GOODMAN RESEARCH GROUP, INC.
Program Evaluation • Consultation • Market Research

Origins of the Universe
Final Evaluation Report

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INTRODUCTION

"Has the universe always existed?" "How did the earth become a place that could harbor life?" These are just a few of the questions that the NOVA Origins project sought to answer for public audiences through a 4-part broadcast series and a national outreach campaign.

The 4-part NOVA Origins miniseries, hosted by astrophysicist Neil deGrasse Tyson, Director of the Hayden Planetarium at the American Museum of Natural History, chronicles the formation of Earth from solar system dust particles that coalesced to become one of the four rocky planets closest to the sun. The TV series covered four primary areas:

- The history of the earth's formation
- How the universe evolved to permit the emergence of life on earth
- The likelihood that there is life beyond earth
- The tools and techniques scientists use to study the universe

The outreach campaign was disseminated through a national network of museums, science centers and community organizations located at ten sites across the country. The participating museums and science centers (known as "partners") received educational resources and technology, including:

- Two 20-minute demonstrations
- Two discovery carts
- A one-hour workshop for middle school children
- A teacher education workshop for middle school teachers

The content for the four outreach resources drew upon two topic areas: how electromagnetic energy (light) is used to provide evidence for objects beyond the earth's atmosphere, and how fossil records can be used to determine the history of the earth and life on the earth.

In May 2004, The Production Group contracted with Goodman Research Group, Inc. (GRG) to conduct a summative evaluation of the Origins 4-part series and national outreach campaign.

This report is organized into three major sections: the evaluation methods, key findings and recommendations for the outreach programming and series broadcast. Overall conclusions are presented at the end of the report.

METHODS

This section describes the evaluation design, data collection methods, and measures.

DESIGN

This summative evaluation intended to provide information about the influence of the Origins series and outreach on the public's awareness and knowledge related to the topic of the scientific origins of the universe.

GRG applied a three-pronged approach to the evaluation: 1) an assessment of how the outreach materials and resources were used by the partners, 2) an assessment of the impact of the outreach programs on child and adult audiences, and 3) a pre-post analysis of the impact of the 4-part series on viewers' knowledge of and interest in the topic.

DATA COLLECTION AND INSTRUMENTS

The data collection procedures and instruments for the three evaluation components are described below.

Partners' Use of Outreach Materials

The organizing framework for assessing the use of the outreach resources included the partners' action plans, continued use forms, and monthly activity logs that were submitted to GRG via the Internet. At the start of the project, following a three-day training and orientation that was held for the partners in May 2004, each partner submitted an **Action Plan** to the Pacific Science Center. The action plans were created by the Pacific Science Center, and asked the partners to describe how they intended to use the Origins materials during the year ahead.

In January 2005, the Pacific Science Center developed and distributed a **Continued Use Form** to the partners**,** which was to be used to either restate or communicate their revised plans for using the outreach materials during the second half of the project year.

During the first week of every month (September 2004 through March 2005), GRG designed and disseminated a Web-based **Activity Log** to the partners. The activity logs collected data from the partners about the Origins programming that occurred during the prior month.

In addition, partners completed two online surveys developed by GRG; a **Training Satisfaction Survey** administered following the training that all partners attended at the start of the project and a **Partner Satisfaction Survey** that was administered six months into the partnership. Samples of all instruments are included in the Appendix.

Impact of Outreach Programming on Public Audiences

The impact of the outreach programming on public audiences was assessed with surveys administered to three samples. GRG designed and administered a **Community Celebration Intercept Survey** for children and adults who attended one of ten Community Celebrations held across the country. Children

and adults were surveyed upon leaving the Celebrations. GRG research associates and field researchers approached individuals as they left the events, and asked if they would be willing to complete a brief survey asking for their opinions about the event, what they experienced, and what they learned from the event. Parallel versions were created for children and adults, and both were given the option of completing a written survey or responding orally to the questions that were read by the researchers.

GRG developed and distributed paper and electronic copies of the **Child Experience Survey** to the partners, which were to be distributed to children attending an Origins-based workshop, demonstration, or other modified Origins outreach program. Similar to the Community Celebration Intercept Survey, the Child Experience Survey was brief and written at a grade-3 reading level. The survey asked respondents to describe their enjoyment of the program and what they learned by attending.

Teacher Education Surveys were developed by GRG and provided to the partners for distribution following any teacher workshops that were delivered. The Teacher Education Surveys were designed to measure teachers' opinions about the usefulness of the workshop and the contributions of the workshop to their professional development.

Impact of the 4-Part Series on Viewers' Knowledge and Interests

GRG recruited 36 adults from across the country using random digit dialing to participate in a study of the 4-part Origins series. Participants were recruited to complete a **baseline survey** about their knowledge and interest in topics concerning the origins of the universe. Following the completion of the baseline survey, participants were given a DVD of the series and asked to watch the four 60-minute programs in the following two weeks. After confirming with participants that they had watched all four programs, they were given a **post-viewing survey** to complete. The post-viewing survey repeated questions asked on the baseline survey in order to assess changes in knowledge and interests. The post-viewing survey also included questions pertaining to their opinions about the series itself.

A second sample of high school students also participated in this study. Similar to the method used with the adults, GRG recruited eight science classroom teachers from across the country to show the first two of the four Origins programs to their classes, and to have their students complete **pre- and post-viewing surveys** to measure changes in knowledge and interests. The teachers also completed a **Teacher Survey** at the end of the study.

PROJECT BACKGROUND

The following information is provided about the outreach and series in order for the reader to have a rich understanding and context for the nature of the project and the specific goals of each component.

ORIGINS OUTREACH PROGRAMMING

In developing the outreach materials, the following objectives were set:

- Have all materials complement the content in the Origins series
- Utilize an experiential approach in the manner of a scientist who asks, "what is the evidence for…"
- Be effective for use in a variety of settings, including formal classrooms, science centers and community center-based programs
- Be effective at serving youth typically under-involved in science experiences
- Have a "shelf life" which continues beyond the airing of the Origins series

The outreach programming was developed around two general topics:

- Electromagnetic energy (light) and how it is used to provide evidence for objects beyond the earth's atmosphere. The outreach components aimed to develop a basic understanding of light, and then use this knowledge to explore the evidence for the existence of planets around other stars, the expansion and age of objects in the universe, the possibility of life on other planets in the solar system, and the search for extraterrestrial life in the galaxy.

- Fossil records and how they are used to determine the history of the earth and life on the earth. The outreach components aimed to explore the variety of fossil records available on the earth and how these help understand the age of the earth, and the role of extinction on the changing nature of the earth.

Using the concepts described above, four outreach resources were produced:

1. Two 20-minute demonstration scripts: Light Decoder and It's Fossil Time!

2. A one-hour workshop, Mission to Sram, designed for middle school youth

3. Two discovery carts: Cladistics Activity Cart and Spectra Activity Cart

4. A two-hour Teacher Education Workshop developed for middle school teachers to introduce them to a supplementary curriculum to be used for introducing students to the scientific principles underlying the origins of the universe.

DELIVERY OF ORIGINS OUTREACH PROGRAMMING

The primary dissemination vehicle for the outreach materials was a network of ten museums and science centers situated across the country. The ten partners

were selected, via an application process, to implement and disseminate the outreach resources to their communities and audiences.

As per the application process, the science centers and museums would serve as the lead institution and partner with a representative from one or more of the following groups:

- Community based organization (e.g. Girl Scouts, libraries, church, Boys and Girls Clubs, Parks and Recreation Center)
- Schools
- Parent group
- PBS station
- University or local "science" organization (e.g. Amateur Astronomers, American Chemical Society chapter)

Selection of the ten sites was based on the institution's ability to:

- Identify and effectively work with a coalition of community organizations
- Effectively serve a large number and wide variety of underserved populations
- Have sufficient staff resources and institution support to implement the programs

Selection of the ten sites was also driven by a need for a reasonable geographic distribution of locations and to have a variety of institution sizes represented.

Once selected, the institutions agreed to organize and host a Community Celebration during the month that the Origins series aired. The Community Celebrations were to be widely publicized public events that would bring together research scientists, community based organizations, educators, students and the public to experience the full range of Origins outreach programming. Participation in the project also included an agreement to continue using the outreach materials on a regular basis for a one-year period.

Each partner received $10,000 to help defray the cost for implementing the program, and received all equipment and materials necessary to conduct the initial offering of each program.

ORIGINS BROADCAST SERIES

The first hour, "Origins: Earth is Born," looked at the first billion years of Planet Earth. Through animation, viewers witnessed the origins of the moon from a collision between Earth and an object believed to have been the size of Mars.

The second hour, "Origins: How Life Began," explored the chemical "signatures" of life inside three-billion-year-old rocks and meteorites found around the world, as scientists sought to link the first life forms to the resilient microorganisms detected in ancient artifacts.

In the third hour, "Origins: Where are the Aliens?," the narrator explored questions about the nature and presence of alien beings on Earth and other planets.

In the fourth and final hour, "Origins: Back to the Beginning," scientists explored the Big Bang and how the colossal forces of the early universe made it possible for habitable worlds to emerge.

RESULTS

PARTNERS' USE OF OUTREACH MATERIALS

Table 1 identifies the partners and their locations.

Table 1
Origins Partners

Partner	Location
Adventure Science Center	Nashville, TN
American Museum of Natural History	New York, NY
Chabot Space and Science Center	Oakland, CA
Explorit Science Center	Davis, CA
Fernbank Science Center	Atlanta, GA
The Franklin Institute	Philadelphia, PA
Hooks Discovery and Learning Center	Indianapolis, IN
International Museum of Art and Science	McAllen, TX
Museum of Science and Industry	Tampa, FL
St. Louis Science Center	St. Louis, MO

Once selected, partners were invited to attend a three-day training in Baltimore to learn about the Origins project and to be introduced to the various resources that would be made available to them. It was also expected that the partners would begin to plan how they would use the outreach materials. The goal was that each partner would begin constructing their Action Plans at the training, complete the Action Plans upon returning home, and then submit a completed plan to the Pacific Science Center two months later.

It proved very challenging for the Pacific Science Center to collect completed Action Plans in a timely manner. The evaluator assisted by creating an online survey that provided partners with structured questions about what types of activities they planned to offer, to whom, and when. In essence, the online survey was an alternate form of the Action Plan.

The Pacific Science Center continued their efforts to collect action plans from the partners and eventually 7 of 10 submitted Action Plans. The Action Plans were primarily short descriptions of the Community Celebrations, with little

consistency in content across partners. Based on an analysis of the Action Plans, it was clear that the goals and expectations for the Action Plans were not clearly communicated to the partners.

The first required activity, and arguably the most defined requirement for the partners, was the Community Celebration that each partner was expected to host during the month that the series aired. The broadcast date occurred earlier than planned. As a result, many partners were faced with organizing the Community Celebrations within a short time frame, and in several sites, without having received all of the outreach materials.

The Community Celebrations occupied an extensive amount of the partners' efforts, and the Origins initiative was off to an energized start. By the end of September, most of the Celebrations had occurred, and in the next three months (October-December) the energy dissipated. There was not a clear articulation of goals and expectations for what the partners were accountable for doing once the Celebrations were complete.

The developers convened a conference call to discuss ways that the partner network could be focused. The Origins developers agreed that the Action Plans primarily focused on the Celebrations, and that it was not clear what the partners were responsible for doing in the months following. In January 2005, the Origins developers initiated the first of several partner conference calls and asked all partners to submit Continued Use Forms outlining their plans to use the materials for the time period beginning in January and continuing through the summer.

As with the Action Plans, the Pacific Science Center had difficulty retrieving Continued Use Forms from some of the partners. The Continued Use Forms were more structured than the Action Plans and this resulted in slightly more detailed plans from the partners.

Although the use and value of the Continued Use Forms was not determined, the conference calls, of which there were three, appeared to be useful to partners in terms of keeping partners focused on their commitment to the project, and providing them an opportunity to meet and talk with other partners by phone. The number of partners participating in the conference calls decreased each time, with only the first call having full partner participation. As will be evident from other evaluation findings, partners from the smaller size institutions were far more likely to participate than were the partners from the larger institutions.

As previously mentioned, partners were asked to complete monthly online surveys detailing how the Origins programming was used during the prior month. The monthly activity logs were collected for six months between September 2004 and March 2005. Table 2 shows the months for which each partner submitted an activity log.

Table 2
Partner completion of activity logs

Partner	Sept	Oct	Nov	Dec	Feb	Mar
Adventure Science Center	√	√	√	√	√	
American Museum of Natural History						
Chabot Space and Science Center	√	√	√	√	√	√
Explorit Science Center	√	√	√	√	√	√
Fernbank Science Center	√		√		√	√
The Franklin Institute			√			
Hooks Discovery and Learning Center	√	√	√	√	√	√
International Museum of Art and Science (IMAS)	√	√	√	√	√	√
Museum of Science and Industry (MOSI)	√	√	√		√	
St. Louis Science Center	√	√	√	√	√	√

Each month, partners were asked to share information about their use of the It's Fossil Time demonstration, the Light Decoder demonstration, the activity carts, the Mission to Sram, and the teacher education workshop. In the September log, partners were also asked to share information about the Community Celebration.

Community Celebrations

GRG collected information about the Community Celebrations from eight partners. All eight partners held their Celebration in September and two partners (Chabot and Hooks) held second Celebrations in November and December. Eight of the Celebrations occurred at the Science Centers and two Celebrations (Explorit and Hooks) were held off-site at a community location. Four of the Celebrations were all day events, with the other four occurring either in the afternoon or evening hours.

Partners were asked to estimate the number of people who attended the Celebrations:

- One partner estimated having between 50-99 people
- Two partners estimated having between 200-299 people
- Two partners estimated having between 300-399 people
- Three partners estimated having between 400-499 people

In several cases, the Origins Community Celebration was embedded into the regular, day-to-day programming offered by the science center. Two partners said people probably did not visit the science center specifically for the Celebration, and one partner said they did not know. The other seven partners indicated that the attendees came to the Celebration specifically for the Origins event.

It's Fossil Time and Light Decoder

Eight partners provided information about their use of the It's Fossil Time and Light Decoder demonstrations for at least 4 of 6 months. Each month, the partners reported the estimated number of times they presented the two demonstrations. Across the months, the partners delivered each demonstration between one and sixteen times per month. The average number of times that It's Fossil Time was delivered was 4.5 times per month, and 7.5 times per month for Light Decoder.

The estimated number of people attending each demonstration varied widely among partners and across months within each partner. The range was between 1-5 people attending to more than 50 people attending. The average number of people attending each demonstration was between 11-20 people.

Between the months of September and December, Light Decoder was regularly presented, and It's Fossil Time was rarely presented. Beginning in February, It's Fossil Time was used significantly more than in previous months. The use of Light Decoder remained constant throughout the project.

Activity Carts

The activity carts appear to have been used regularly by six of the ten partners. The carts were primarily used within the museums. Four partners indicated that they were additionally using the activity carts in schools and community sites. Due to the nature of the carts, partners estimated that, on average, more than 50 people interacted with the activity carts each month.

Mission to Sram

Only two partners presented the Mission to Sram with any regularity. According to the activity logs, four of eight responding partners never presented Mission to Sram. For the two partners who presented the Mission to Sram at least once per month, they tended to present it at the science center or at a school or community organization. Mission to Sram was almost always presented to children and families, and to groups ranging in size from 6-10 people to 21-30 people.

Teacher Workshop

Of the eight responding partners, five partners indicated that they never presented a teacher workshop. The three partners indicating they had presented the workshop did so one or two times, in total.

PARTNERS' SATISFACTION WITH THE ORIENTATION WORKSHOP

In May 2004, the partners were invited to attend an Origins orientation workshop in Baltimore. The purposes of the workshop were to formally introduce partners

to the Origins project, give the partners an opportunity to experience and familiarize themselves with the various resources they would be receiving, begin planning their implementation of the resources, and meet and network with the other partners.

A few months after the workshop, partners completed a Web survey about their opinions of the workshop. The Web survey was administered a few months after the workshop so that partners could reflect on its usefulness in light of their anticipation of officially beginning their participation.

Fifteen respondents representing nine partner institutions completed the online survey. Overall, respondents were very satisfied with the workshop. On a scale of *Poor*, *Fair*, *Good*, and *Excellent*, 80% of respondents rated their overall experience as *Excellent*. The remaining 20% indicated that their overall experience was *Good*. Using the same scale, 87% of respondents said that the organization of the workshop was *Excellent*, and 80% indicated that the workshop facilitators were *Excellent*.

Partners were presented with a list of six workshop objectives, and asked to indicate for each objective whether the workshop met their expectations.

As seen in Table 3, many of the respondents' expectations were exceeded. A small percentage of respondents' expectations were not met with regard to acquiring some of the resources while at the workshop and learning about specific activities and events that they could hold. In many respects, the workshop aimed to provide a general overview and introduction to the project so that partners could have maximum flexibility in how they implemented the programming. However, there were some partners who expected to receive tangible resources and more concrete parameters for implementing the resources.

Table 3
Expectations for the Workshop

Workshop Objectives	Exceeded expectations	Met expectations	Didn't meet expectations
Gain new information about project overall	9	6	-
Gain new information about available resources	10	5	-
Acquire some of the resources	7	7	1
Learn about activities and events that could be held	9	4	1
Meet other national partners	7	8	-
Share ideas with other partners	8	7	-

Numbers in cells are the number of respondents.

To gauge partners' opinions about the different ways in which the workshop was valuable, they were presented with six facets of the workshop, and were asked to rate the value of each facet using a 1-5 scale, with 1 equal to *not at all valuable*, 2

equal to *a little valuable*, 3 equal to *somewhat valuable*, 4 equal to *very valuable*, and 5 equal to *extremely valuable*. Table 4 shows the average rating for each facet.

Table 4
Workshop Value

How valuable was the workshop in doing the following:	Average
Reviewing the Origins resources	4.9
Participating in hands-on activities	4.8
Hearing others' ideas and project plans	4.7
Coming to the conference as a team	4.7
Discussing the Community Celebrations	4.6
Reviewing participation requirements	4.6

N = 15

As shown by respondents' average ratings, the partners found the workshop to be *very* or *extremely* valuable across multiple facets. The partners agreed that the workshop was successful in terms of providing them an overview of the project, giving partners the opportunity to interact with and experience the Origins materials first hand, and providing a venue for partners to hear about others' ideas and project plans.

PARTNERS' SATISFACTION WITH THEIR INVOLVEMENT

GRG administered a Web-based Partner Satisfaction survey to the ten partners in January 2005. A representative from all ten partner institutions completed the survey.

Overall, the partners were very satisfied with their involvement in the Network. When asked:

- 8 of 10 partners said they would *definitely* become involved with the project if they had it to do over again.
- 2 of 10 partners said they would *probably* be involved if they had to do it again.

When asked how satisfied the partners were with the support they've received from the Pacific Science Center on a scale of 1-5, with 1 equal to *not at all satisfied* and 5 equal to *extremely satisfied*, the average rating was 4.1.

The following quotes represent the range of benefits the partners experienced as a result of their involvement with the Origins project.

> *"This project has been a wonderful opportunity for our Center. We were able to receive materials and develop new programming on an up to date topic that, without the help of this project, would not have happened."*

"We are a small outreach center, and this has been an opportunity to meet and work with other organizations of all sizes with similar missions."

"Origins is the best project I have been involved with in my short time at the museum. Not only were the materials a big hit with our audiences (particularly light decoders), but it inspired me to try new kinds of programming I might otherwise not have done. In addition, the professional development component of Origins has plugged me into a dedicated network of museum professionals who I will continue to access as resources in the future."

As evidenced by the partners' responses, having an opportunity to connect with other institutions across the country was as important as the benefits of receiving additional programming.

Following up on the question about whether partners would become involved with the project again if given the opportunity, partners were asked whether the time and effort required of being in this partnership was worth the benefits. Eight of ten partners said "definitely yes," one partner said "maybe yes," and one partner said "maybe no."

Partners' explanations were similar to above. Two explanations that were particularly descriptive were:

"There is no question that this partnership did require a significant commitment of time and energy, particularly in regards to the Community Celebration and collaboration with community agencies. However, the contacts that it has helped build both with other science centers and with community organizations have been invaluable, and will last long into the future. The outreach programs that have been developed will also hopefully last a long time."

"It takes a large amount of time to develop a program. To have that done, the materials pre-purchased, packaged and shipped to us, was worth a lot. Also, the professional development training in Baltimore was very valuable."

In order to assess the extent to which the Origins resources were addressing the partners' programming needs, partners were presented with a list of the different Origins resources they had received, and were asked to rate the benefit of each resource using a 1-5 Likert scale (1 equal to *not at all beneficial* to 5 equal to *extremely beneficial*).

As summarized in Table 5, partners reported that, overall, the Origins resources were *very* or *extremely beneficial* (average rating of 4.4), and all of the individual resources were rated, at a minimum, to be moderately beneficial to the partners' institutions.

Table 5
Benefits of the Origins Resources

How beneficial was each resource to the institution:	Average
Resources OVERALL	4.4
20-minute Light Decoder Demonstration	4.3
Spectra Activity Cart	4.1
Mission to Sram Workshop	4.1
20-minute It's Fossil Time Demonstration	3.6
Cladistics Activity Cart	3.5
Teacher Workshop	2.8

N = 10

It was important to know how easy it was to integrate the Origins resources into the partners' institutional programming. Similar to the question asking about the benefits of the resources, respondents rated the ease of integrating the resources using a 1-5 Likert scale (1 = *not at all easy* and 5 = *extremely easy*).

Displaying a pattern somewhat similar to partners' opinions of the benefit of each resource, partners rated the Light Decoder Demonstration and Spectra Activity cart as easiest to integrate, and the Teacher Education and Mission to Sram workshops as the least easy to integrate.

Table 6
Ease of integrating the resources into institution programming

How easy was it to integrate each resource into the institution programming:	Average
Resources OVERALL	4.2
20-minute Light Decoder Demonstration	4.3
Spectra Activity Cart	4.2
Cladistics Activity Cart	3.7
20-minute It's Fossil Time Demonstration	3.4
Mission to Sram Workshop	3.1
Teacher Workshop	2..6

N = 10

One of the goals of the Origins outreach efforts was to create resources that were adaptable to the varied programming needs of the partner institutions. Therefore, it was expected that the resources would be modified to some degree.

Partners were asked whether their institutions had used each of the resources and in what contexts. The ten partners were equally split among three uses for the resources. Three partners reported that they primarily share the resources with general visitors to the museum or science center, three partners said they primarily take the resources off-site to share the resources with community

organizations or schools, and four partners said they typically work with community or school groups who are brought into the museum or science center.

As presented in Table 7, the majority of resources had been used, with only the Teacher Education Workshop not being delivered in most cases. Table 7 also presents the number of partner institutions modifying the resources.

Table 7
Number of partners using the resource and percent modifying the resource

Resource	Number using the resource	Number modifying the resource
Spectra Activity Cart	10	6
Cladistics Activity Cart	9	6
20-minute Light Decoder Demonstration	9	7
20-minute It's Fossil Time Demonstration	9	5
Mission to Sram Workshop	8	6
Teacher Workshop	3	1

N = 10

Partners were asked to describe how they modified each resource. Responses are summarized for each resource, below.

Spectra and Cladistics Activity Carts

- Integrated into a 90-minute program
- Modified the cart to reach younger audiences by adding picture identification match sets, posters, fact sheets and make-and-take-home activities
- Converted the activity into a science demonstration to be used by schools
- Used in conjunction with pre-existing activity cart in the Earth & Environmental Gallery of the Science Center
- Blended the activity cart with the It's Fossil Time demonstration for a longer floor presentation
- Placed skulls inside clear containers to protect them
- The resource is being used as part of a 30-minute class that is given before students take a trip to the Dinosaur Moveable Museum
- Used in a 45-minute theatrical show, as well as helping fulfill scout badges

20-minute Light Decoder and It's Fossil Time Demonstrations

- Integrated into a 90-minute program
- Modified the resource to fit more of a table top activity structure because demonstration space is limited, and facilitators could interact with more visitors at a table
- Used in a 45-minute theatrical show
- Blended the activity cart with the It's Fossil Time demonstration for a longer floor presentation

- Converting the activity into a science demonstration to be used by schools
- Used the materials in the Earth and Environmental Sciences Gallery to supplement demonstrations and activity tables

Mission to Sram Workshop

- Developed into after school program
- Use Sram as a geology cart with identification charts and posters
- Developed into a 4-5 week after school program
- Plan to use it this summer during camp programs

Teacher Education Workshop

- Incorporated various elements of the teacher workshop into my own series of astronomy workshops focused on the Hubble Space Telescope

Partners benefited in unique ways from their involvement with the Origins project. When asked to give examples of the value of their involvement, respondents cited the value of having access to new programming that increased the variety of activities that a science center offers. Partners also defined the value in terms of being able to teach sophisticated science concepts to visitors. Finally, partners acknowledged that the Origins project increased the technology aspect of demonstrations and programs. Representative quotes follow:

> *"The materials were of particular significance to our small museum because many of the things mentioned above had either never been done before or not done for a long time (i.e. teacher workshops, live floor demonstrations, and star parties). So, the Origins materials gave us a jump start on new programming that might not have happened otherwise."*

> *"Provided us fresh, new programs and materials ready to use along with the background training. We do not usually have much funding provided for professional development opportunities, so that was a welcome plus. The quality of materials will allow us to continue to present the programs to a variety of audiences."*

> *"The Origins materials have allowed us to expand our outreach programming topics, develop a closer relationship with our community partner, and given us access to a network of science centers that we didn't have before."*

One partner indicated that the value of participating has been limited because they "have the personnel and the equipment to write and produce much more effective presentations, tailored exactly to [their] target audiences."

Partners' activity logs indicated that the Teacher Education Workshops did not occur as often as expected. Partners were asked what factors made it difficult for the workshops to occur, and replied that the summer was a better time to hold workshops for teachers, and that it was difficult to get teachers to attend due to the current climate of many schools. Partners also stated that many of their

science centers were not accustomed to giving teacher workshops and that coordinating this new endeavor represented a learning curve and a significant amount of effort for some.

Further, one partner pointed out that it had been communicated to partners that the partnership was focused on collaborations with community organizations. Had the focus been on collaborations with schools, the teacher workshops may have been more successful. Some partners felt that given their limited time and resources, the teacher workshop component required significant effort, but did not appear to be central to the project.

The Origins producers were interested in knowing whether the partners encountered any reactions to Origins based on religious beliefs and values. Three of ten partners indicated "yes." The three partners explained the reactions they experienced, as follows:

> *"The Origins project, as well as a future space wing being developed, opened a discussion with a conservative staff member on evolution versus intelligent design, bringing the subject out in the open that had been skirted before. Probably a good thing!"*

> *"Yes, but not very frequently or vocally in any significant way. We incorporated Origins materials as a main focus of a changing exhibition that was on-site for three and a half months, and in that time we handled a few calls from religious home school groups that were concerned about bringing their groups to the science center."*

> *"Some teachers mentioned the tension that they have when the kids ask them about the Big Bang and what started things. They do not quite know how to handle such questions at times."*

In the spirit of documenting best practices, the partners were asked what advice they would offer to the developers of the Origins resources in terms of maximizing the impact of the materials on science centers like theirs. Partners offered six suggestions, each touching on a unique issue. Partners suggested that outreach developers do the following:

- Communicate a clear and explicit message to science centers about the expectations for using the resources.
- Introduce a mechanism from the start that encourages and monitors accountability.
- Provide resources that have flexible delivery methods.
- Assist the science centers with publicity and getting patrons to attend the events.
- Deliver the final versions of all resources, materials, and equipment far in advance of the project start date.

- Include more items and tokens that visitors can take home with them.

- For future initiatives, retain the in-person training and kick-off meeting that was held in Baltimore.

IMPACT OF OUTREACH ON PUBLIC AUDIENCES

Community Celebrations: Adult Survey Data

Across eight Community Celebrations, 154 adults (61% females) completed a survey upon leaving the Celebration.

Table 8
Sample

Science Museum	# Surveys
Adventure Science Center	6
Chabot Space and Science Center	3
Explorit Science Center	11
The Franklin Institute	18
Fernbank Science Center	13
International Museum of Art and Science	36
Museum of Science and Industry	45
St. Louis Science Center	22
Total	**154**

The respondents represented three types of attendees. Thirty-one percent of the respondents indicated that this was their first encounter with the science center, 33% of respondents had encountered the science center between two and four times, and 35% reported that they had previously encountered the science center five or more times.

On the day of the Community Celebration, 69% of respondents had spent between one and three hours at the celebration. Twenty-three percent of respondents had spent between 3.5 to 5 hours at the celebration, and 4% each spent either less than one hour or 6-8 hours at the celebration.

Forty-four percent of the respondents attended the event specifically for the Origins Community Celebrations. Regardless of whether or not the individuals attended the event specifically for the Community Celebrations, visitors learned of the event in a variety of ways.

- 31% of respondents learned of the event after arriving and either heard an announcement advertising the events, saw a flyer in the science center, or stumbled upon the different events as they traveled through the science center.

- 25% of respondents learned of the Community Celebration from their child or their child's school.

- 16% of respondents cited a general marketing announcement such as a flyer, email, or radio broadcast, as the way that they found out about the Community Celebration.

- 13% of respondents learned of the Celebration through a community organization such as the Girls Scouts.

- 11% found out about the Celebration through word-of-mouth

- 4% received a notification from the science center itself.

Eighty-two percent of the adult respondents attended the Community Celebration with a child, supporting the observation that these were primarily family-oriented events.

Each of the Community Celebrations consisted of a variety of demonstrations, presentations, and Origins-related events. Some of the Celebrations were similar, but many adapted the Origins resources to the specific needs of the partners and interests of the audiences.

The survey asked attendees to identify three Origins-related demonstrations, activities or other events that they experienced during their visit, and then to rate how interesting each of the events were on a 1-5 scale of *not at all interesting* (1), *a little interesting* (2), *somewhat interesting* (3), *very interesting* (4), and *extremely interesting* (5). Respondents described all three of the events that they identified as being *very interesting*, with the average rating across all events being 4.2 on the 5-point scale.

Adults were asked to share one thing that they learned from attending the Community Celebrations. Although their exact responses varied greatly, all respondents reported that they learned something either about fossils, the stars and galaxies, the properties of the light spectrum, and the amount of time involved with the growth and development of the Universe. For example, "I learned about supernovas giving off the x-ray/gamma rays that can be seen," "How fossils form," "Gases have colors," "How little time humans have existed," and "To be an investigator is a lot of work."

When given the choice of answering *less likely*, *equally likely*, or *more likely*, 79% of respondents said they were *more likely* to visit the science center again as a result of the Community Celebration, and 20% said they were equally likely to visit the science center again.

When choosing between the same possible responses, respondents were asked how likely they were to watch a movie or show about the Universe, and how likely they were to visit a Web site about the topic as a result of the Community Celebrations.

- *63% of respondents were more likely to watch a movie or show about the Universe.*

- *32% of respondents were equally likely to watch a movie or show about the Universe.*

- *52% of respondents were more likely to visit a Web site about the topic.*

- *43% were equally likely to visit a Web site on the topic.*

Community Celebrations: Child Survey Data

Across nine Community Celebrations, 200 children (63% girls) completed a survey upon leaving the Celebration. The children's ages ranged from 4-16 years, with an even distribution across the range. The average age was 10 years old.

Table 9
Sample

Science Museum	# Surveys
Adventure Science Center	5
Chabot Space and Science Center	7
Explorit Science Center	21
The Franklin Institute	5
Fernbank Science Center	32
Hooks Discovery and Learning Center	53
International Museum of Art and Science	36
Museum of Science and Industry	20
St. Louis Science Center	21
Total	**200**

In the interest of learning about the influence of the Community Celebrations on future behaviors, children were asked if the Community Celebration led them to want to do any of the following:

- Visit the science center again (97% yes)
- Try any of the activities they saw at their own home (84% yes)
- Watch a movie or TV program about Universe (68% yes)
- Visit a Web site to learn more about the Universe (64% yes)

The children were asked how much fun they had at the Celebration and whether they learned new things. The children were shown four smiling faces, accompanied by "Yes" and "No" in different font sizes and asked to choose the one that best matched their feelings.

Pick the one that shows how you feel.	YES!	Yes	No	NO!
Did you have fun at today's event?	81%	18%	1%	1%
Did you learn new things today?	70%	24%	4%	2%

N = 200

Ninety-nine percent of the children said they had fun, and 94% of the children said they learned new things.

Children were asked to share some of the things that they did and learned at the Community Celebrations. The following are examples of children's responses, in their own words.

- The age of life on earth using a tape measure
- Made a bottle rocket
- Saw the It's Fossil Time show
- Learned about science
- Learned about liquid nitrogen and oxygen
- Learned how old fossils and rocks are
- Learned how to make a rainbow with lights
- Learned how to determine whether something is a meat or plant eater
- Looked through spectra viewers
- Looked at Venus
- Went to the Planetarium
- Went to the Star Lab
- Found out how far the sun is from the earth
- Learned about space
- Went to the Light Decoder show
- Learned about space, fossils and planets
- Brighter doesn't always mean hotter
- How to decode light
- I learned a lot of things that are very interesting
- Science can be real cool

Children's favorite part of the day included making bottle rockets, playing with the light decoders, seeing the fossils, and looking at stars. Children seemed impressed by learning about liquid nitrogen and oxygen, and expressed wonder about all that we know about space.

Fewer children had something to say in response to being asked about their least favorite part of the day. Some children didn't have a comment to share because "the day rocked!" and one child commented that her least favorite part of the day was "leaving." Of the children who did have something that they didn't like about the Celebration, several cited a lecture, a planetarium show, and watching a video or movie. One conclusion from their responses is that they preferred the hands-on activities.

Ongoing Child Experience Surveys

Origins partners were asked to distribute feedback surveys to children following any workshops that were given throughout the year. In total, four of ten partners collected child experience surveys: Adventure Science Center, Chabot, Explorit, and IMAS. Combined, the four partners collected 256 surveys from children asking their opinions about one of three possible demonstrations or workshops: Mission to Sram, Light Decoder, and It's Fossil Time. The table below summarizes how many surveys were collected by each museum, and from which demonstrations.

Table 10
Sample

Science Museum	Mission to Sram # Surveys	Light Decoder # Surveys	It's Fossil Time! # Surveys	Total
Adventure Science Center	0	33	24	57
Chabot Space and Science Center	36	47	8	91
Explorit Science Center	23	9	0	32
International Museum of Art and Science (IMAS)	0	76	0	76
Total	**59**	**165**	**32**	**256**

The demographics of the sample did not differ according to the type of demonstration, and are therefore presented in the aggregate. The children were a nearly equal mix of girls (49%) and boys (51%) who ranged in age from three years to fifteen years. The average age was nine years old. Seventy percent of the sample was between the ages of nine and eleven years.

Because the three demonstrations differ in content and format, the survey findings will be reported for the individual workshop type rather than aggregated across the three types of demonstrations or workshops.

Mission to Sram

Youth attending a Mission to Sram workshop were asked whether they learned something new. They responded by selecting *Yes, I learned a lot, Yes, I learned a little, No, I didn't learn much,* or *No, I didn't learn anything*. 83% of the children (47 of 57) selected *Yes, I learned a lot.* An additional 12% selected, *Yes, I learned a little*, and 5% reported that *No, I didn't learn much*.

Children were asked to describe how much of what they saw and heard they understood by selecting one of the following: *I understood all of it, I understood most of it, I understood some of it,* or *I didn't understand any of it*. Fifty-seven percent (32 of 56) *understood all of it*, 29% *understood most of it*, and 14% *understood some of it*.

More than three-quarters of the children said they had a lot of fun at the workshop. Thirteen percent said they had some fun, and 4% said they didn't have much fun or any fun at all.

The children were asked to share their favorite part of the Mission to Sram experience. Fifty-two children wrote down their favorite part:

- 33% said interacting with the fossils was their favorite part,
- 30% said operating the rover was their favorite part,
- 23% said that the painting activity was their favorite, and
- 14% communicated that the overall activity, the Mission, was the best part.

The children shared their opinions about what could make the Mission to Sram better. Of the twenty-six children who offered a suggestion to improve Mission to Sram, 50% of the suggestions were requests for more and/or better equipment. These suggestions included a greater number of fossils, fossils that were real, and requests for fresh, new batteries. Fifteen percent of the children requested more time to interact with the Mission and less time spent talking. The final 15% of suggestions were a mix of recommendations, including free video games, to hold the workshop outside, and to watch a movie.

Light Decoder

One hundred sixty-five children attended Light Decoder demonstrations at four science centers and completed a survey about their experience. Ninety-nine percent of the children reported that they learned either a lot or at least a little, and 1% (n =1) of the children said they didn't learn much.

When asked to choose between *I understood all of it, most of it, some of it,* or *none of it*, 38% said they understood all of it, 53% said they understood most of it, and 9% said they understood some of it.

Eighty-three percent of the children indicated they had a lot of fun and 16% said they had some fun. One percent (n = 1) said they didn't have that much fun.

One hundred forty-five children wrote down their favorite part of the Light Decoder demonstration. Children's favorite parts represented a full range of responses from the very general "I liked everything" and "My favorite part was learning about light" to the very specific "My favorite part was the big light bulb," "I liked the chicken," "I liked analyzing gas spectrums," and "My favorite part was learning that blue stars are hotter than red stars."

One hundred eleven children responded to the question asking for their suggestions for improving the Light Decoder demonstration. Of the 111 children who responded, 42% said that nothing could be improved because it was great as is. An additional 22% of children requested more hands-on elements in the demonstration including going on a ride that simulated a moon landing and being able to try dried foods that astronauts eat, and generally having more opportunity to touch and manipulate materials. Nine percent of the children said that they wished they had more time to explore and be at the science center, and 8%

commented on the process and format of the demonstration and said they wanted an opportunity to ask more questions, be able to see and hear better, and asked that the presenter talk more slowly. The remaining 19% of the children offered a miscellaneous assortment of requests that were dominated by being distracted by other features in the science center, such as a playground.

It's Fossil Time

Thirty-two children representing two science centers attended an It's Fossil Time demonstration and completed a survey about their experience. Ninety-six percent of the children reported that they learned either a lot or at least a little, and 3% of the children (n =1) said they didn't learn much.

When asked to choose between *I understood all of it, most of it, some of it,* or *none of it*, 72% said they understood all of it, 19% said they understood most of it, 6% said they understood some of it, and 3% (n = 1) said they didn't understand any of it.

Seventy-two percent of the children indicated they had a lot of fun and 25% said they had some fun. Three percent (n = 1) said they didn't have that much fun.

Twenty-five children shared their favorite part of the It's Fossil Time demonstration, and all 25 responses concerned some aspect of seeing, exploring, and learning about fossils. For example, "guessing which fossil matched which animal," "seeing all the different skulls," "learning about what sequence animals came in," and "learning about how the alligator's bones are porous and help it float."

The children were also asked to share their recommendations for improving the It's Fossil Time demonstration. Eleven children responded and requested that the demonstration be more game-oriented (n = 3), that the demonstration include more fossils and pictures (n = 3), more opportunities to touch and play with the fossils (n = 2), and that food be served (n = 2). One additional child remarked that the demonstration would be better "if the animals were actually there."

Teacher Education Workshop

GRG received completed Teacher Education Workshops for one workshop held at the Adventure Science Center. The Origins Teacher Workshop was one of several workshops that teachers attended during a one-day event at the Adventure Science Center. Of the 36 surveys that Adventure Science Center collected, only five were definitely completed about the Origins Teacher Education workshop. Eleven surveys were completed about a non-Origins workshop on astrobiology, and 18 could not be linked to a workshop topic. Since so few surveys were collected from the Origins workshop and there was confusion about the distribution of these surveys, this data is not summarized.

IMPACT OF THE SERIES ON VIEWERS

The primary goal of the series was to increase viewers' knowledge about how the universe began in a way that was easy to understand and interesting. A second goal of the series was to catch viewers' interest and curiosity for the subject matter, in hopes that viewers would be more likely to seek out similar information in the future or engage in new behaviors related to the topic.

Two samples were recruited to participate in an assessment of the impact of the series on viewers' knowledge, attitudes, and interests. One sample included high school science students and the other sample was a randomly selected group of adults from across the United States.

The two samples followed a similar method. Prior to viewing the Origins series, participants completed a pre-survey that consisted of background questions, questions about attitudes and interests, and 13 multiple-choice content questions. After submitting the completed pre-survey to GRG, participants received a copy of the series. In the interest of available classroom time, the high school students watched Programs 1 and 2. The adult sample watched all four programs. After confirming that they had watched the required programs, participants were given a post-survey to complete that was similar to the pre-survey, in order to measure change after watching the program. The findings are reported for each sample, below.

High School Science Students

Eight high school science teachers from across the country were recruited to participate. The teachers taught biology, ecology, geography and integrated science to grades 9-12. The teachers selected one or more of their classrooms to participate. In total, 19 classrooms consisting of 409 high school students participated in the study.

There were slightly more female (56%) than male students in the study, and 72% of the students indicated they were Caucasian. Fourteen percent of the students were Latino, 13% were African-American, and 2% were Native American.

The majority of students were in the ninth or tenth grade (78%), and the remaining 22% were in the eleventh or twelfth grade. In the interest of knowing what science subjects they had previously studied in school, students reported that they had studied biology (89%), physics (24%), chemistry (17%), and astronomy (6%). Thirty percent indicated they had studied other sciences, including anatomy, ecology, and genetics.

Changes in students' knowledge

In order to discuss changes in knowledge as a result of watching the Origins series, the findings discussed here are limited to the 300 students who completed both the pre- and post-survey.

Prior to watching the Origins series, students rated their knowledge about the topic using a 1-5 scale, with 1 equal to *not at all knowledgeable*, 2 equal to *a*

little knowledgeable, 3 equal to *somewhat knowledgeable*, 4 equal to *very knowledgeable*, and 5 equal to *extremely knowledgeable*. As seen in Table 11, students considered themselves to be *a little* or *somewhat knowledgeable* about the different aspects of the series.

Table 11
Knowledge

How knowledgeable are you about:	Average rating
The history of the earth's formation	2.9
How the universe evolved to permit the emergence of life on earth	2.6
The tools and techniques scientists use to study the universe	2.5

N = 300

Students were asked to imagine they were having a conversation with a friend about aspects of the series. Students were asked before and after watching the series how accurate they thought their conversations would be. Students indicated their expected accuracy using a 1-5 scale, with 1 being *not at all accurate* and 5 being *extremely accurate*. See Table 12 for the average ratings before and after watching the programs.

Table 12
Accuracy

How accurate would your conversation be if it was about:	Pre-average rating	Post-average rating
The history of the earth's formation	2.5	3.2**
How the universe evolved to permit the emergence of life on earth	2.4	3.0**
The tools and techniques scientists use to study the universe	2.1	2.4**

N = 299
* Differences statistically significant at p<.00

A more direct measure of whether the conversation would be more accurate after watching the programs can be determined by comparing the students' pre- and post-content quiz scores. Both before and after watching the programs, students were asked 13 multiple choice questions that called directly upon content presented in the programs. Prior to watching the programs, students scored an average of 6 correct questions out of 13. After watching the program, students scored an average of 7 correct questions out of 13.

In order to evaluate changes in pre- and post-score, a difference score was calculated for each student. The individual difference scores indicate that 61% of the sample did better on the quiz after watching the programs, 24% of the sample did worse on the post-quiz, and 15% of the individual's scores did not change.

For the 182 students whose score increased over time, the change in scores ranged from one additional question answered correctly on the post-quiz to seven additional questions answered correctly on the post-quiz.

The last two questions on the post-survey asked students to rate how challenging the questions were on a 1-5 scale (1 equal to *not at all challenging*, 5 equal to *extremely challenging*), and to indicate how many of their answers were guesses.

Prior to watching the programs, students rated the quiz questions to be *somewhat challenging* (average = 3.3), and that they had guessed on approximately 5-8 questions. After watching the programs, students rated the quiz questions to be less challenging (average = 2.6), and on average, students guessed on 1-4 questions.

In addition to increasing students' knowledge, the program also aimed to be interesting and to spark a curiosity for learning more about the topic. To assess these motivational outcomes, students were asked questions about their interests and preferences for spending their leisure time pursuing related topics.

Prior to watching the programs, students were asked if they had done any of the following in the previous twelve months:

Table 12
Activities in the past 12 months

Have you done this in the past 12 months?	% Yes
Watched a movie or TV program about the history of the universe and/or life on earth	69%
Visited a science museum or science center	40%
Read a book about the history of the universe and/or life on earth	30%
Visited a Web site to learn about the history of the universe and/or life on earth	30%
Attended a lecture or presentation about the history of the universe and/or life on earth	18%

N = 292-294

After watching the programs, students were asked how likely they were to do each of the above as a result of watching the programs. Students were asked whether they were *more*, *equally* or *less* likely to do each.

Table 13
Likelihood

How likely are you to do this in the next year as a result of watching?	% More likely	% Equally likely	% Less likely
Watch a movie or TV program about the history of the universe and/or life on earth	30%	49%	21%
Visit a science museum or science center	24%	52%	24%
Read a book about the history of the universe and/or life on earth	10%	62%	28%
Visit a Web site to learn about the history of the universe and/or life on earth	14%	51%	35%
Attend a lecture or presentation about the history of the universe and/or life on earth	8%	51%	41%

N = 298-300

Analyses were conducted to examine whether students' participation in any of the above behaviors in the past year corresponded to their performance on the content quiz. Students who indicated that they had visited a Web site or a science museum in the past 12 months did significantly better on the post-viewing content quiz. The other behaviors showed no relation to performance on the content quiz.

After watching the programs, students were asked how interesting they thought the program was and whether the information was presented clearly. Students rated their opinions on both dimensions using a scale of completely disagree to completely agree.

Table 14
Opinions

Rate your opinion	Completely disagree	Somewhat disagree	Neutral	Somewhat agree	Completely agree
Origins was interesting	11%	8%	20%	46%	15%
The information was presented clearly	4%	9%	19%	43%	25%

N = 298-299

Following up on the question asking students to imagine that they were having a conversation with a friend about the origins of the universe, they were asked about the likelihood of such a conversation and how comfortable they would be doing so. Students were asked this set of questions before and after watching the programs, and made their responses using a scale of 1-5, with 1 equal to *not at all* and 5 equal to *extremely*.

Table 15 shows the pre- and post- average ratings for students' likelihood of having conversations about the topics and their comfort level doing so.

Table 15
Likelihood and comfort

How likely is it that you will have conversation about:	Pre-average rating	Post-average rating
The history of the earth's formation	1.7	2.1**
How the universe evolved to permit the emergence of life on earth	1.7	2.1**
The tools and techniques scientists use to study the universe	1.6	1.8*
How comfortable would you be having a conversation about:		
The history of the earth's formation	2.9	3.0*
How the universe evolved to permit the emergence of life on earth	2.8	2.9*
The tools and techniques scientists use to study the universe	2.7	3.1**

N = 298-300
** Differences statistically significant at p<.00; * p<.05

Analyses were conducted to look for differences between girls and boys on the variables of interest and knowledge. Prior to watching the Origins programs, girls were significantly less interested in knowing about the tools and techniques used to study the universe, less likely to have a conversation with someone about the topics in the Origins programs, and also less comfortable doing so. Girls did not think their conversations would be any less accurate than the boys thought their conversations would be, and girls and boys scored similarly on the content quiz. Lastly, girls indicated being more likely than boys to visit a science museum in the next year.

On the post-survey that was completed after watching the programs, some of the gender differences detected on the pre-survey did not persist. Girls still thought they were more likely than boys to visit a science museum, and indicated they would be less comfortable having a conversation about the tools and techniques scientists use to study the universe. Girls and boys scored similarly on the post-test content quiz.

Teacher Survey

Eight teachers completed the teacher survey after watching Origins with their class. Overall, teachers had a positive opinion of *Origins*. Using a scale from 1 to 5 with 1 equal to *completely disagree*, 2 equal to *somewhat disagree*, 3 equal to *neither agree nor disagree*, 4 equal to *somewhat agree*, and 5 equal to *completed agree*, all teachers indicated that they either *somewhat agreed* (n=4) or *completely agreed* (n=3) that Origins was interesting. Six teachers *completely agreed* that the information was presented clearly while the remaining teachers *somewhat agreed*.

Using a scale from 1 to 5 with 1 equal to *not at all likely*, 2 equal to *a little likely*, 3 equal to *somewhat likely*, 4 equal to *very likely* and 5 equaled *extremely likely*, half the teachers indicated that they were *extremely likely* to watch *Origins* again,

while the other half were *very likely* to watch it again. All teachers were either *very likely* (n=5) or *extremely likely* (n=3) to recommend *Origins* to others.

Teachers were asked to rate, using a 4-point scale with 1 equal to *nothing*, 2 equal to *a little*, 3 equal to *some* and 4 equal to *a lot*, how much students learned about topics related to the origins of the universe (see Table 16). Most teachers indicated that students learned *some* or *a lot* about each topic. Teachers felt that students learned the most about the history of the earth's formation.

Table 16
Student Learning

How much did students learn about:	Nothing	A little	Some	A lot	Average Rating
The history of the earth's formation	0	0	3	5	3.6
How the universe evolved to permit the emergence of life on earth	0	1	4	3	3.3
The tools and techniques scientists use to study the universe	0	1	2	5	3.5

N = 8

Teachers were asked, in an open-ended format, what the most important thing was that their students learned from *Origins*. Four teachers responded that students learned about the formation of the moon and its relationship with earth, while three teachers indicated that the scientific techniques used to study this topic were most important, and the remaining teacher felt that the overview of cosmic history was most important.

Teachers were asked, in an open-ended format, what, if anything, they would change about *Origins* so that students learned more. One teacher recommended including less footage of scientists talking while another indicated he would like more information on the moon and another felt that the students found the 24-hour clock confusing. The remaining teachers felt that nothing should be changed, but that it would be better to use *Origins* with upper level science classes.

Adult Viewers

Thirty-six adults between the ages of 20 and 62 years participated in the study. The sample was an equal mix of men (50%) and women, representing Caucasians (81%), Latinos (14%), African-Americans (3%), and Native Americans (6%).

The sample's education background varied:

- 8% had some high school
- 17% had a high school diploma
- 36% had some college
- 8% had an Associate's degree

- 25% had a Bachelor's degree
- 3% had a Master's degree
- 3% did not respond

The participants' professions included an accountant, audio engineer, carpenter, home-maker, pharmacist, real estate agent, and sales person. Their incomes ranged from less than $20,000 to more than $75,000 a year.

Changes in knowledge

Prior to watching the Origins series, participants rated their knowledge about the topic using a 1-5 scale, with 1 equal to *not at all knowledgeable*, 2 equal to *a little knowledgeable*, 3 equal to *somewhat knowledgeable*, 4 equal to *very knowledgeable* and 5 being *extremely knowledgeable*. As seen in Table 17, participants, on average, considered themselves to be *a little* or *somewhat knowledgeable* about the different aspects of the series.

Table 17
Knowledge

How knowledgeable are you about:	Average rating
The history of the earth's formation	2.8
How the universe evolved to permit the emergence of life on earth	2.6
The tools and techniques scientists use to study the universe	2.4

N = 36

Respondents were asked to imagine they were having a conversation with a friend about each of the same aspects of the series. Respondents were asked before and after watching the series how accurate they thought their conversations would be using a 1-5 scale, with 1 equal to *not at all accurate*, 2 equal to *a little accurate*, 3 equal to *somewhat accurate*, 4 equal to *very accurate*, and 5 equal to *extremely accurate*. See Table 18 for the average ratings before and after watching the programs.

Table 18
Accuracy

How accurate would your conversation be if it was about:	Pre-average rating	Post-average rating
The history of the earth's formation	2.9	3.4*
How the universe evolved to permit the emergence of life on earth	2.8	3.2
The tools and techniques scientists use to study the universe	2.1	2.8*

N = 31
* Differences statistically significant at p<.05

A more direct measure of whether the conversation would be more accurate after watching the programs can be determined by comparing the respondents' pre-

and post-content quiz scores. Prior to watching the programs, respondents scored an average of 6 correct questions out of 13. After watching the programs respondents scored an average of 8 correct questions out of 13.

In order to evaluate changes in pre- and post-score, a difference score was calculated for each respondent. Based on the individual difference scores, 80% of the sample did better on the quiz after watching the programs, and 20% of the sample did worse on the post-quiz.

For the 25 participants whose scores increased over time, the change in scores ranged from one additional question answered correctly on the post-quiz to six additional questions answered correctly on the post-quiz, with the majority increasing their score by 3 questions.

In addition to increasing viewers' knowledge, the program also aimed to be interesting and to spark a curiosity for learning more about the topic. To assess these motivational outcomes, respondents were asked questions about their interests and preferences for spending their leisure time on related topics.

Prior to watching the programs, respondents were asked if they had done any of the following in the previous twelve months:

Table 19
Activities in the Past 12 Months

Have you done this in the past 12 months?	% Yes
Watched a movie or TV program about the history of the universe and/or life on earth	59%
Visited a science museum or science center	29%
Read a book about the history of the universe and/or life on earth	32%
Visited a Web site to learn about the history of the universe and/or life on earth	21%
Attended a lecture or presentation about the history of the universe and/or life on earth	18%

N = 34

After watching the programs, respondents were asked how likely they were to do each of the above as a result of watching the programs. Participants were asked whether they were *more*, *equally* or *less* likely to do each.

Table 20
Likelihood

How likely are you to do this in the next year as a result of watching?	% More likely	% Equally likely	% Less likely
Watch a movie or TV program about the history of the universe and/or life on earth	71%	23%	7%
Visit a science museum or science center	48%	39%	13%
Read a book about the history of the universe and/or life on earth	19%	65%	16%
Visit a Web site to learn about the history of the universe and/or life on earth	26%	42%	32%
Attend a lecture or presentation about the history of the universe and/or life on earth	39%	36%	26%

N = 31

Analyses were conducted to examine whether participation in any of the above activities in the past year corresponded to their performance on the content quiz. The activities showed no relation to performance on the content quiz.

After watching the programs, participants were asked how interesting they thought the program was and whether the information was presented clearly. Respondents rated their opinions on both dimensions using a scale from *completely disagree* to *completely agree*.

Table 21
Opinions

Rate your opinion	Completely disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Completely agree
Origins was interesting	19%	13%	7%	16%	45%
The information was presented clearly	19%	3%	7%	36%	36%

N = 31

Continuing with the question asking viewers to imagine that they were having a conversation with a friend about the origins of the universe, they were asked how likely they thought it was that they would have such a conversation, and how comfortable they would be doing so. Respondents used a scale of 1-5, with 1 equal to *not at all* , 2 equal to *a little*, 3 equal to *somewhat*, 4 equal to *very*, and 5 equal to *extremely*. Table 22 shows the pre- and post- average ratings.

Table 22
Likelihood and comfort

How likely is it that you will have conversation about:	Pre-average rating	Post-average rating
The history of the earth's formation	2.3	3.2**
How the universe evolved to permit the emergence of life on earth	2.4	3.2**
The tools and techniques scientists use to study the universe	2.2	3.0**
How comfortable would you be having a conversation about:		
The history of the earth's formation	3.5	3.5
How the universe evolved to permit the emergence of life on earth	3.4	3.5
The tools and techniques scientists use to study the universe	2.7	3.1

N = 29-30
** Differences statistically significant at p<.00

In contrast to the student sample, there were no gender differences in responses.

CONCLUSIONS AND RECOMMENDATIONS

This report summarizes the data collected to evaluate the NOVA Origins project. The NOVA project was a national effort to inform and interest the general public in topics surrounding the origins of the universe through a national outreach campaign and a national series broadcast.

Consistent with the way that the evaluation findings were organized, the conclusions and recommendations are presented separately for the outreach and series.

ORIGINS OUTREACH

In developing the outreach materials, the following objectives were set:

- Have all materials complement the content in the Origins series
- Utilize an experiential approach in the manner of a scientist who asks, "what is the evidence for…"
- Be effective for use in a variety of settings, including formal classrooms, science centers and community center-based programs
- Be effective at serving youth typically under-involved in science experiences
- Have a "shelf life" which continues beyond the airing of the Origins series

The primary dissemination vehicle for the outreach materials was a network of ten museums and science centers situated across the country selected to

implement and disseminate the outreach resources to their communities and audiences. As per the application process, the science centers and museums would serve as the lead institution and partner with a community organization.

The following conclusions were drawn from the data collected from the partners and families and children experiencing the outreach materials.

Families and children enjoyed their Origins experiences, they learned something new, and some were inspired to learn even more.

97% of the children surveyed said that they hoped to visit the museum again as a result of their Origins experience, and 84% expected to try some of the activities they saw at home.

Children's favorite part of the Community Celebrations included making bottle rockets, playing with the light decoders, seeing the fossils, and looking at stars. Children seemed impressed by learning about liquid nitrogen and oxygen, and expressed wonder about all that we know about space.

Of the children who offered a recommendation for how the Origins experience might be improved, children's recommendations centered on increasing the number of hands-on activities.

The Community Celebrations were successful in reaching both new and familiar audiences.

The respondents represented three types of Celebration attendees. Thirty-one percent of the respondents indicated that this was their first encounter with the science center, 33% of respondents had encountered the science center between two and four times, and 35% reported that they had previously encountered the science center five or more times.

Some Celebrations connected with their communities more authentically than others.

Field researchers attended 8 of 10 Community Celebrations and observed that some celebrations produced a level of community engagement and connection that was deeper than others. Observations led to the conclusion that Celebrations that appeared to be more successful at connecting with the community had the following characteristics:

- The smaller the institution the more apparent the community connection.
- Celebrations held off-site (for example, at a school) correlated with greater audience engagement in the Origins experience.
- Celebrations that were held at a special time or day, apart from museum's regular hours were more focused and energized.

Partners' participation in the network varied over time and across sites

There are several findings supporting this conclusion. First, the Pacific Science Center faced significant challenge in collecting Action Plans and Continued Use

forms from some partners. The Action Plans that were collected contained few details and were primarily focused on the Community Celebrations. The goals and expectations for the Action Plans were not clearly communicated to the partners.

Second, there was a noticeable decrease in the partnership energy and efforts following the Community Celebrations. There was not a clear articulation of goals and expectations for what the partners were accountable for doing once the Celebrations were completed. The initiation of partner conference calls, as well as some partners' attendance at the NASA sponsored event re-focused the group.

Third, partners from the smaller size institutions were far more likely to participate in the evaluation activities and conference calls than the larger institutions. Two partners did not comply with the evaluation requirements and minimally participated in the larger network via conference calls and submission of their Action Plans.

Partners appreciated the opportunity to attend the training workshop prior to the project's onset.

Partners were very satisfied with the workshop and their expectations for what they would gain by attending were exceeded. The partners agreed that the workshop was successful in terms of providing them an overview of the project, giving partners the opportunity to interact with and experience the Origins materials first hand, and providing a venue for partners to hear about others' ideas and project plans.

8 of 10 partners said they would definitely become involved with the project again.

Overall, the partners were very satisfied with their involvement in the project as well as with the support they received from the Pacific Science Center. Partners valued receiving additional programming and having an opportunity to connect with other institutions across the country.

The Origins materials addressed the partners' programming needs.

Partners reported that the Origins resources were very beneficial and easy to integrate into the partners' institutional programming. Partners indicated that the Light Decoder Demonstration and Spectra Activity cart were the easiest to integrate, and the Teacher Education and Mission to Sram workshops were the least easy to integrate.

The Teacher Education Workshops and Mission to Sram were under-utilized.

Partners' activity logs showed that the Teacher Education Workshops did not occur as often as expected. Partners were asked what factors made it difficult for the workshops to occur, and replied that the summer was a better time to hold workshops for teachers, and that it was difficult to get teachers to attend due to the current climate of many schools. Partners also stated that many of their

science centers were not accustomed to giving teacher workshops and that coordinating this new endeavor represented a learning curve and a significant amount of effort for some.

Further, one partner pointed out that it had been communicated to partners that the partnership was focused on collaborations with community organizations. Had the focus been on collaborations with schools, the teacher workshops may have been more successful. It seemed that partners felt that given their limited time and resources, the teacher workshop component required significant effort but did not appear to be central to the project.

The link between the Origins Outreach and the Origins Series was weak.

The strongest evidence to support this conclusion was that by the end of this evaluation, most of the partners had not ever received a copy of the series.

GRG offers the following recommendations for the Origins Outreach:

- Communicate a clear and explicit message to partners about the expectations for using the resources.
- Increase the amount of hands-on activities for children.
- Emphasize and support the role of the community partners so that there is a more authentic engagement of the community.
- If teacher resources are developed, consider the system that will be used to disseminate the resources. In this project, the expectation that partners would deliver the workshops to teachers on their own was not successful. As a result, the resource was under-used.
- The foundation of this project rested on the creation of partnerships. In the future, more development is recommended for building the partnerships. Partnerships take effort, planning, and commitment. The in-person workshop and conference calls contributed to building the partnership.

ORIGINS SERIES

The primary goal of the series was to increase viewers' knowledge about how the universe began in a way that was easy to understand and interesting. A second goal of the series was to pique viewers' interest in and curiosity for the subject matter, in hopes that viewers would be more likely to seek out similar information in the future or engage in new behaviors related to the topic.

After watching the programs, people believed that they were more likely to have a conversation with someone about the related topics, they would be more comfortable doing so, and they would be more accurate in what they could say about the origins of the universe.

Both samples indicated their expected likelihood, comfort, and accuracy in conversing with others about the history of the earth's formation, how the earth evolved to permit human life, and the tools that scientists use to study the earth significantly increased.

Both samples improved their scores on the post-viewing content quiz. Sixty-one percent of the student sample did better on the quiz after watching the programs, and 81% of the public audience sample did better on the post-quiz.

In addition to increasing participants' knowledge, the program also led to increases in participants' interest and curiosity for learning more about the topic.

After watching the programs, respondents were asked how likely they were to engage in several leisure activities as a result of watching the programs. Many respondents were more likely to watch another movie or TV program about the topic, and nearly half of the respondents said they were more likely to visit a science museum or attend a lecture on the topic as a result of watching the program.

GRG offers the following recommendations for the Origins Series:

- Respondents commented that although they learned new information in a format that was mostly clear and somewhat to very interesting, the entire series was long and dense. This raises concern about the broad appeal of this series to the general public. The series aired over two consecutive days, each broadcast two hours in length. The adult audience had greater gains in knowledge and overall had more positive opinions than the student sample. In order to increase the general appeal of the program to a wide variety of audiences, and to assure that viewers watched the entire program, producers of future programs should consider shorter, less dense segments that could be viewed in a variety of contexts.
- Following on the recommendation to produce shorter and less dense segments, GRG recommends that future initiatives anticipate and make available such segments so that they can be used to better integrate the series and the outreach.

APPENDICES

Appendix A: Partner Action Plans
Appendix B: Monthly Activity Log
Appendix C: Training Satisfaction Survey
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Appendix J: Teacher Survey

APPENDIX A: PARTNER ACTION PLANS

PACIFIC SCIENCE CENTER

ORIGINS TRAINING WORKSHOP, MAY 12-14, 2004

Space Telescope Science Institute, Baltimore, MD

WEDNESDAY, MAY 12TH	
Depart Radisson Hotel	8:00
Check-in	8:30-9:00
Welcome	9:00-9:45
Introduce Origins staff	9:45-9:50
Workshop agenda	9:50-9:55
Pre-workshop questionnaire	9:55-10:10
Light Detectors demonstration	10:10-10:35
Break	10:35-10:50
Light Demo and Light Cart materials	10:50-12:00
Lunch	12:00-1:00
Inquiry Cubes	1:00-1:45
Questioning w/Skulls	1:45-2:45
Break	2:45-3:00
Origins Evaluation plan	3:00-4:00
Overview of NASA's Origins Program	4:00-5:00
End of day announcements	5:00-5:05

Thursday, May 13th	
Fossil Finders demonstration	9:00-9:30
Fossils Cart and Fossils Materials	9:30-10:30
Break	10:30-10:45
Paleo-biologist speaks about cladistics	10:45-11:45
Video Series Preview/Q&A	11:45-12:45
Brown Bag Lunch	12:45-1:45
Two-hour Enrichment Workshop	1:45-3:45
Break	3:45-4:00
Community Celebration overview	4:00-5:00
End of day announcements	5:00-5:05
Reception at HST Institute	5:05-6:30

Friday, May 14	
Teacher materials overview	9:00-9:30
Community Celebration Brainstorming	9:30-10:30
Break	10:30-10:45
ViewSpace preview	10:45-11:30
STScI tour	11:30-12:45
Brown Bag Lunch	12:45-1:45
Organizations planning time	1:45-2:30
Workshop Logistics & Payment paperwork	2:30-3:00
Project Plan Presentations	3:00-3:45
Next steps	4:00

Adventure Science Center
Community Celebration Date
Saturday, September 25, 2004 10:00 - 3:00 (main event)

Partners

- Nashville Public Television
- 4 Metropolitan Nashville master teachers
- Judy Butler & Todd Gary, Institute for Understanding Biological Systems at Tennessee State
- FASST (Fisk University, Vanderbilt University, NASA)
- Middle Tennessee Space Society
- Barnard-Seyfert Astronomical Society
- Pitsco

Presenters

- Dr David J James, FASST
- Chuck Schlemm, Middle Tennessee Space Society
- Barnard-Seyfert Astronomical Society members
  Adventure Science Center educators and volunteers
- **Schedule**
  FASST (Fisk-Vanderbilt NASA Roadshow) running "inflatable" planetarium shows/presentations 10 – 3
- NPT will host a booth with information about the Origins TV 10 - 3
- Adventure Science Center educators and volunteers will present Origins demonstrations periodically 10 - 3
- Middle Tennessee Space Society and Barnard-Seyfert Astronomical Society will host displays and demonstrations of telescopes and satellite models 10 - 3
- Sudekum Planetarium will feature "Hubble: Images of the Infinite" at 11:00 and 2:00
- Sudekum Planetarium will feature "Skies Over Nashville" at 12:00

Other events

- Science Safari Teacher (and families) Open House -- Sept. 14
- ASC educators presenting Origins demonstrations and handing out information on Origins
- NTTI (National Teacher Training Institute) ORIGINS – Sept. 11, 8 – 5, with NPT and ASC, all sessions focused on Origins materials developed by PBS, by 4 master teachers for NPT, and TSU astrobiology team
- Rocket Building Workshop, Nov. 6, 10 - 3, Sponsored by Pitsco, origins demos will be presented, materials given to teachers

Outreach events

- FASST will present "inflatable" planetarium shows (when possible)
- Adventure Science Center educators will present Origins demonstrations

Locations for Outreach events

- Metropolitan Nashville community centers -- dates TBD
- Metropolitan Nashville public libraries -- dates TBD

Chabot Space Science Center
Origins Community Celebration

Saturday, September 18, 2004

~ Schedule of Events ~

Biology Lab

Teacher Workshop
10:00am-11:00am

Spees Floor Demo or Our Place

Geology Cart (Galaxy Explorers Demo)
11:00am-1:00pm

Dellums Floor Demo

Skulls Cart (Galaxy Explorers Demo)
2:00pm-3:00pm

Computer Lab

11:00-4:00pm (Origins web site)

Amphitheater

Science Theater show with Audience Participation about hot scientists date the universe (Galaxy Explorers)

2:00pm The Dating Show (It's Fossil Time)
4:00pm The Dating Show " " "

Chem/Physics

11:00am-12noon (Tom and Galaxy Explorers)
Light Decoders/Spectra Cart Activities

Ask-a-Scientist Stations

12:00pm-4:00pm

- Tracy Richmond McKnight, Assistant Professor of Radiology UC Berkeley
- Jennifer Johnson and Michelle Goldsmith, NASA Ames Research Center
- Oakland Zoo
- UC Berkeley Space Sciences Lab
- Lockheed Martin
- LLNL/LBL

Distinguished Lecture Series

TBD

In addition to the program above, we will be conducting outreach throughout the year:

- Origins Demo Activities will be used by our Galaxy Explorers on Community Partner Days, one day each month
- Origins Demo Activities will be incorporated into Chabot-to-Go Outreach Program which includes school science fairs, community fairs, etc.
- We are in conversation with KQED about showing the Nova Series in our Megadome large screen theater in HDTV
- We are in conversation with a professional performer who does school assemblies on a musical production of the "Big Bang."

Programming for Origins Community Science Celebration
Explorit Science Center
September 25, 2004 1:00-4:30

Exhibition: presented by Explorit

- In the exhibit hall will be the exhibition: "Inner Earth to Outer Space: Origins of life and the Universe"

Demonstrations: presented by Explorit Staff

- NOVA Origins Light Decoders *Demonstration*
- NOVA Origins Fossil *Demonstration*
- NOVA Origins Cladistics Activity Cart
- NOVA Origins Spectra Activity Cart

Solar System Ambassadors

- David Takemoto-Weerts
  1. Display Booth: a. models of rovers and exploration crafts;
     b. historical perspectives of the Mars Missions; how have these mission evolved since the first in 1976
     c.posters and interactive displays

Astronomy Clubs

- Sacramento Valley Astronomical Society
  1. Solar Telescopes:
  2. Display Booth: a. posters and interactive displays
     b. activities for all ages
- Davis Astronomy Club

ViewSpace

- a multimedia presentation featuring recent images from the Hubble Space Telescope.

Fossil Dig!

- A geologist facilitates a fossil dig in our sand pit 38' x 20'.

Activity Tables may include:

- make a constellation tube
- make a planisphere
- make a zodiac wheel
- make a constellation
- folding star map
- build a model rocket
- build a Mars (Sram) rover
- make a fossil
- fossil rubbings

Still in the Solicitation Process:

- Star Lab
- A cosmology lecturer
- A geology lecturer

Fernbank Science Center
Origins plan: Celebration September 18th, 12-5pm

Our partner is the Girl Scouts and we will be targeting 5th –8th grade girls and their families.

Dekalb Co. Libraries will be participating by setting up a booth with books for children that support the Origins Program (books on dinosaurs, astronomy, geologic time).

Our event is called the Fall Festival.

Planetarium "sky tonight" program – 10 minute sky tonight tour in the planetarium.
Scheduled to occur at 12, 1, 2, 4, & 5

Learning with light:(using light cart demo materials, diffraction gratings, etc)
Scheduled to occur at 12:30, 2:30, 4:30

Meet Dr. Dino: (using props from geologic cart – laundry basket, outfits, etc.)
Scheduled to occur at 1, 2, 3, 4, & 5

Observatory tours: (short tour of observatory/look through the 36" telescope if weather permits)
Scheduled to occur at 12:15, 1:15, 2:15, 3:15, 4:15

A walk through time: geologic time laid out on the floor for people to wander and read for themselves when life first formed to when man took over the land. Continuous and self-guided.

Make and take booths: make some spacecraft models from paper patterns, etc. Continuous and self-guided

Hooks Discovery and Learning Center
Community Celebration

Hook's Discovery & Learning Center will hold two different community celebrations to highlight the PBS/NOVA series Origins. The first celebration is scheduled for 28 September 2004 to coincide with the premier of the series. Hook's Discovery & Learning Center has partnered with WFYI, the local PBS station, to sponsor a premier party. Invitees include the boards of both organizations, donors, and other members of the community. A cocktail reception will be held at the Holcomb Observatory on the campus of Butler University. Education staff will be on site to demonstrate cart activities and highlight education curriculum. Guests will have the opportunity to attend a planetarium show and listen to a representative from the Astronomy Department talk about the night skies of Indiana. Weather permitting; guests will then have an opportunity to use the telescope. At 8:00 p.m. we will reconvene to view the first two episodes in the Origins series. Guests will have the opportunity to ask questions and discuss their thoughts between the first and second show.

The second celebration, scheduled for early December, will be a Science Fair culminating five weeks of afterschool programming. Hook's Discovery & Learning Center has partnered with the Boys and Girls Clubs of Indianapolis to facilitate a new afterschool program, *Is there Life Out There?* based on PSC education outreach materials, to all seven of the middle school Boys and Girls Clubs. At the end of the five weeks, all seven participating clubs will set up their projects, based on *The Mission to SRAM*, at the Keenan-Stahl Boys & Girls Club. Currently, we are talking with the Challenger Center about the potential for experts in the field to be in attendance to answer questions related to the program or about careers. Not only will families and teachers be invited for this event, but also 10-15 children from each club will be chosen to attend this event. Further, other 21st Century Clubs within Indianapolis will also be invited. Students will showcase their projects and, with the help of WFYI, we will re-air one of the Origins shows to all in attendance.

IMAS: Partner in the PBS Series Nova: Origins
To be held September 23, 2004 at 6:00 p.m. at the International Museum of Art and Science

6:30-6:45 Introductions

Introduction	Lewis P. Savoie IMAS Executive Director
Background Information	Serena Rosenkrantz, IMAS Education Director
Introduction to the Series	KMBH Representative
Introduction to the Partnership	Raquel Hinojosa, Outreach Director, Daniel Tyx, Curriculum Developer, and Melissa Gonzalez, Avance

6:40-7:30 Special Guests

Introduction to Special Guests	Lewis P. Savoie, IMAS Executive Director
Speaker, Emma DeLeon, UTPA	
Speaker, to be determined	
Q & A	Daniel Tyx, IMAS Curriculum Developer, Moderator
Closing Remarks	Steven Winger, IMAS Board President

7:30-9:00 Breakout Sessions

Two forty-five minute sessions—participants switch at 8:15

Breakout session topics:

1) What is dark matter (if it exists)? (Daniel Tyx, IMAS Curriculum Developer)
2) Are we alone?: the search for life on other planets (Daniel Tyx, IMAS Curriculum Developer)
3) Creationism and evolution discussion session (leaders to be determined)
4) Amateur astronomy: Getting a start (Vernon Weckerbacher, Museum Curator)
5) Project Genesis (Carol Lutsinger, Brownsville ISD)
6) The Rio Grande Valley and the fossil record (Mike Baldwin, Brownsville)
7) Design a water bottle rocket (Museum Outreach Staff)
8) Experience space gravity (Museum Outreach Staff)
9) Space in a box (Museum Outreach Staff)
10) It's Fossil Time! demo (Avance Students)
11) Light decoders: introduction to spectroscopy (Avance Students)
12) Mission to Sram: Mars Rover simulation (Avance Students)
13) Viewspace
14) Mobile planetarium (Museum Guide)

9:00-10:00 Telescope Viewing Museum Staff

Partners: KMBH (local PBS affiliate), NASA, University of Texas-Pan American, South Texas College, University of Texas-Brownsville, Avance, STARS (local astronomy group), GEAR UP, Region One (Texas Education Agency), Santa Ana National Wildlife Refuge, Boys and Girls Clubs, IB (International Baccalaureate) Academy

APPENDIX B: MONTHLY ACTIVITY LOG

Each month the partners were emailed the link to the monthly activity log. Each log was slightly different, but similar to the log presented below. Because this was an online survey, formatting was also different from the survey below.

Origins Activity Log
September 2004

Please use this log to describe the Origins programming that occurred between September 1 and September 30, 2004.

What Museum or Science Center are you reporting on? *TEXT BOX*

Community Celebrations

Did your Museum or Science Center hold a Community Celebration this month? ❑ No ❑ Yes

If no, skip to Sram Workshop

How many Celebrations were held this month? Drop down 1-5

Please describe the first Celebration that was held:

On what date was the Celebration held? September *blank DD*

Where was the Celebration held? At the Museum/Science Center
Other location, specify:

What time did the Celebration take place? Began:
Ended:

Approximately how many people attended the Celebration? *Drop down*
0-49
50-99
100-149
150-199
200-299
300-399
400-499
500-799
800-999
More than 1000

How did you track the number of attendees?

Which of the following is true?	This was the number of attendees we expected We expected more attendees We expected fewer attendees

How would you characterize the primary audience? (Check one.)

- ❒Adults (ages 18+)
- ❒Children
- ❒Families
- ❒Teachers and other Educators
- ❒Other (specify)

IF A SECOND CELEBRATION WAS HELD REPEAT THE ABOVE QUESTIONS.

It's Fossil Time! Demonstrations

Was the "It's Fossil Time" demonstration presented this month?	No Yes

If no, skip to "Light Decoder"

Was the "It's Fossil Time" demonstration presented during the Celebration?	No Yes
Was the "It's Fossil Time" demonstration presented at times other than the Celebration?	No Yes
How many times was the demonstration presented this month, in total?	Drop down 1-30 & more than 30 times
Where was the demonstration presented? (If the workshop was presented multiple times, indicate each unique location by checking all that apply.)	At the museum At a school At a community center Other location, specify:
On average, approximately how many people attended each demonstration?	*Drop down 1-5* *6-10* *11-15* *16-20* *21-30* *31-40* *41-50* *More than 50*

How did you track the number of attendees?

Which of the following is true?	This was the number of attendees we expected We expected more attendees We expected fewer attendees

How would you characterize the primary audience? (Check one.)

- ❒Adults (ages 18+)
- ❒Children
- ❒Families
- ❒Teachers and other Educators
- ❒Other (specify)

Light Decoder Demonstrations

Was the Light Decoder demonstration presented this month?	No Yes

If no, skip to Activity Carts

Was the Light Decoder demonstration presented during the Celebration?	No Yes
Was the Light Decoder demonstration presented at times other than the Celebration?	No Yes
How many times was the demonstration presented this month, in total?	Drop down 1-30 & more than 30 times
Where was the demonstration presented? (If the workshop was presented multiple times, indicate each unique location by checking all that apply.)	At the museum At a school At a community center Other location, specify:

On average, approximately how many people attended each demonstration?	*Drop down* *1-5* *6-10* *11-15* *16-20* *21-30* *31-40* *41-50* *More than 50*

How did you track the number of attendees?

Which of the following is true?	This was the number of attendees we expected We expected more attendees We expected fewer attendees

How would you characterize the <u>primary</u> audience? (Check one.)

- ❒Adults (ages 18+)
- ❒Children
- ❒Families
- ❒Teachers and other Educators
- ❒Other (specify)

Activity Carts

Were the activity carts used this month?	No Yes

If no, skip to Sram Workshops

Were the Activity Carts presented during the Celebration?	No Yes
Were the Activity Carts presented at times other than the Celebration?	No Yes
Where were the activity carts made available? (If the carts were made available in multiple locations check all that apply.)	At the museum At a school At a community center Other location, specify:

Approximately how many people interacted with the activity carts, in total, this month?	*Drop down* *1-5* *6-10* *11-15* *16-20* *21-30* *31-40* *41-50* *More than 50*

How did you track the number of people who interacted with the activity carts?

Which of the following is true?	This was the number of attendees we expected We expected more attendees We expected fewer attendees

How would you characterize the primary audience? (Check one.)

- ❒Adults (ages 18+)
- ❒Children
- ❒Families
- ❒Teachers and other Educators
- ❒Other (specify)

Sram Workshops

Was the Sram Workshop presented this month?	No Yes

If no, skip to Teacher Workshops

Was the Sram Workshop presented during the Celebration?	No Yes
Was the Sram Workshop presented at times other than the Celebration?	No Yes
How many times was the Sram Workshop presented this month, in total?	Drop down 1-30 More than 30 times

Where were the Sram Workshops presented? (If the workshop was presented multiple times, indicate each unique location by checking all that apply.)	At the museum At a school At a community center Other location, specify:

On average, approximately how many people attended each workshop?	*Drop down* *1-5* *6-10* *11-15* *16-20* *21-30* *31-40* *41-50* *More than 50*

How did you track the number of attendees?

Which of the following is true?	This was the number of attendees we expected We expected more attendees We expected fewer attendees

How would you characterize the primary audience? (Check one.)

- ❒Adults (ages 18+)
- ❒Children
- ❒Families
- ❒Teachers and other Educators
- ❒Other (specify)

Teacher Education Workshops

Was the Teacher Education Workshop presented this month?	No Yes

If no, skip to final section

Was the Teacher Education Workshop presented during the Celebration?	No Yes
Was the Teacher Education Workshop presented at times other than the Celebration?	No Yes
How many times was Teacher Education Workshop presented this month, in total?	Drop down 1-30 & more than 30 times

Where was the Teacher Education Workshop presented? (If the workshop was presented multiple times, indicate each unique location by checking all that apply.)	At the museum At a school At a community center Other location, specify:
On average, approximately how many people attended each workshop?	*Drop down* *1-5* *6-10* *11-15* *16-20* *21-30* *31-40* *41-50* *More than 50*
How did you track the number of attendees?	
Which of the following is true?	This was the number of attendees we expected We expected more attendees We expected fewer attendees

How would you characterize the primary audience? (Check one.)

- ❒Adults (ages 18+)
- ❒Children
- ❒Families
- ❒Teachers and other Educators
- ❒Other (specify)

In the space below, please feel free to comment further on any of the Origins-related activities that were held in September 2004.

Thank you for completing this survey!
We will send the next Activity Log at the end of October 2004.

APPENDIX C: TRAINING SATISFACTION SURVEY

Online Survey – In print copy only.

APPENDIX D: PARTNER SATISFACTION SURVEY

The format of the actual survey was different that was is presented below because it was online.

Origins Partner Satisfaction Survey
January 2005

Welcome to the Origins Partner Satisfaction Survey being conducted by Goodman Research Group, Inc. To begin the survey, enter your email address in the space below. The survey consists of 13 questions. We recommend that you set aside 20 minutes to complete the survey.

In contrast to the types of information collected on the monthly activity logs, the questions you'll be asked relate to your opinions about the usefulness and value of the Origins materials and your overall experience thus far.

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1. How <u>beneficial</u> were each of the following Origins resources to the programming needs at your institution?	**Not at all beneficial**	**A little beneficial**	**Moderately beneficial**	**Very beneficial**	**Extremely Beneficial**
Cladistics Activity Cart	❑	❑	❑	❑	❑
Spectra Activity Cart	❑	❑	❑	❑	❑
20-minute Light Decoder demonstration	❑	❑	❑	❑	❑
20-minute It's Fossil Time! Demonstration	❑	❑	❑	❑	❑
2-hour teacher education workshop	❑	❑	❑	❑	❑
Sram Workshop	❑	❑	❑	❑	❑
The Origins resources OVERALL	❑	❑	❑	❑	❑

2. How <u>easy</u> was it to integrate each of the following Origins resources into your institution programming?	**Not at all easy**	**A little easy**	**Moderately easy**	**Very easy**	**Extremely easy**
Cladistics Activity Cart	❑	❑	❑	❑	❑
Spectra Activity Cart	❑	❑	❑	❑	❑
20-minute Light Decoder demonstration	❑	❑	❑	❑	❑
20-minute It's Fossil Time! Demonstration	❑	❑	❑	❑	❑
2-hour teacher education workshop	❑	❑	❑	❑	❑
Sram Workshop	❑	❑	❑	❑	❑
The Origins resources OVERALL	❑	❑	❑	❑	❑

3. For each of the following Origins resources, has your institution used the resource exactly as you received it or have you modified it?	**Have not used the resource**	**Used the resource exactly**	**Modified the resource**	**If resource was modified, explain how.** **(For example, expanded into a 90-minute presentation)**
Cladistics Activity Cart	❑	❑	❑	
Spectra Activity Cart	❑	❑	❑	
20-minute Light Decoder demonstration	❑	❑	❑	
20-minute It's Fossil Time! demonstration	❑	❑	❑	
2-hour teacher education workshop	❑	❑	❑	
Sram Workshop	❑	❑	❑	

4. Has your institution's use of the Origins resources occurred <u>primarily</u>: (Check only one)

❑ with general visitors to the museum or science center
❑ at community organizations or schools
❑ with organized community groups brought into the museum or science center
❑ other (specify): _____

5. Overall, how many people does your institution serve in a one-year period?
[drop down with choices]

6. Taking into account the size of your science center, the scope of your exhibits and programs, and the audiences your institution serves, in what ways have the Origins resources been of value to your institution?

7. Teacher Education workshops have not occurred as often as expected. What has made it difficult to deliver the Teacher Education workshops?

8. Have you encountered any reactions to Origins based on religious beliefs and values? ❑ Yes ❑No

If yes, please describe.

9. If you had it to do over again, would you become involved with this project?

❑	❑	❑	❑
Definitely Yes	Probably Yes	Probably Not	Definitely Not

Explain the reasons for your rating. [open text box]

10. Given the time and effort required of your science center to be in this partnership, are the benefits worth the costs?

❑	❑	❑	❑
Definitely Yes	Maybe Yes	Maybe No	Definitely Not

Explain the reasons for your rating. [open text box]

11. What advice would you offer to the developers of the Origins resources in terms of maximizing the impact of the materials on a science center like yours? [open text box]

12. How satisfied have you been with the technical support you've received from the Pacific Science Center?

❑ Not at all satisfied ❑ A little satisfied ❑ Somewhat satisfied ❑ Very satisfied ❑ Extremely satisfied

13. Is there anything the Origins producers or the Pacific Science can do to better serve you at this time?
[open text box]

APPENDIX E: COMMUNITY CELEBRATION INTERCEPT SURVEYS

Child Intercept Survey

Are you a: Boy or Girl ? *(circle one)*

How old are you? _____

Can you tell me three things you did today?

1.
2.
3.

Can you tell me what you learned from doing those things?

Pick the face that shows how you feel.	YES!	Yes	No	NO!
Did you have fun at today's event?	☺	😐	😐	☹
Did you learn new things today?	☺	😐	😐	☹

What was your favorite part about today?

What was your least favorite part about today?

Please answer yes or no to my last questions. Did today's Celebration make you want to do any of the following:

Visit the museum again	Yes	No
Watch a movie or TV program about the universe	Yes	No
Visit a Web site to learn more about this topic	Yes	No
Try any of the activities you saw today at home	Yes	No

Thanks for your feedback!

Adult Intercept Survey

Are you a: ❒ Male ❒ Female

Including today, how many times have you visited this museum?
❒ One ❒ Two ❒ Three ❒ Four ❒ Five or more

How long were you at the museum today? _____ Hour(s)

Did you visit the museum today specifically for the Origins event? ❒Yes ❒ No

How did you learn about today's event?

Did you attend today's event with a child? ❒ Yes ❒ No

Please name up to 3 exhibits you went to today, and rate how interesting they were to you.

Exhibits	Not At All Interesting	A Little Interesting	Somewhat Interesting	Very Interesting	Extremely Interesting
	❒	❒	❒	❒	❒
	❒	❒	❒	❒	❒
	❒	❒	❒	❒	❒

What is one thing you learned from today's event?

As a result of today's event, are you <u>more</u>, <u>less</u>, or <u>equally</u> likely to do the following:

	More likely	Equally likely	Less likely
Visit the museum again	❒	❒	❒
Watch a movie or show about the Universe	❒	❒	❒
Visit a Web site to learn more about this topic	❒	❒	❒

Overall, how much did you enjoy your visit to the museum today?

Not at all	A little	Somewhat	Moderately	A lot
❒	❒	❒	❒	❒

Did you know about the NOVA program "Origins of the Universe" before coming to today's event?
❒Yes ❒No

Do you plan to watch it when it airs on Sept. 28-29? ❒Yes ❒No ❒I don't know

APPENDIX F: CHILD EXPERIENCE SURVEY

1. Are you a boy or a girl? ❒ Boy ❒ Girl

2. How old are you? _____

3. Did you learn new things today? Mark only ONE box.

❒ Yes, I learned a lot
❒ Yes, I learned a little
❒ No, I didn't learn much
❒ No, I didn't learn anything

4. Did you understand what you heard and saw? Mark only ONE box.

❒ I understood all of it
❒ I understood most of it
❒ I understood some of it
❒ I didn't understand any of it

5. Did you have fun at today's event? Mark only ONE box.

❒ Yes, I had a lot of fun
❒ Yes, I had some fun
❒ No, I didn't have that much fun
❒ No, I didn't have fun at all

6. What was your favorite part about today's event?

7. What, if anything, could make today's event better?

Thanks for your feedback!

APPENDIX G: TEACHER EDUCATION SURVEY

Tell us what you thought about the Origins Teacher Workshop!

How did you learn about today's workshop?

How much did today's workshop increase your interest in learning about the origins of the universe?

Not at all	A little	Somewhat	Moderately	A lot
1	2	3	4	5

How much did today's workshop increase your knowledge about the origins of the universe?

Not at all	A little	Somewhat	Moderately	A lot
1	2	3	4	5

What is one teaching strategy you learned from today's workshop?

What is one piece of content knowledge you learned from today's workshop?

How helpful was today's workshop in:	Not At All Helpful	A Little Helpful	Somewhat Helpful	Very Helpful	Extremely Helpful
Increasing your understanding of how to teach your students about the origins of the universe?	❒	❒	❒	❒	❒
Increasing your understanding of how to integrate technology with your science teaching?	❒	❒	❒	❒	❒
Providing you with activities and resources to use in planning your science lessons?	❒	❒	❒	❒	❒
Motivating you to carry out these activities with your students?	❒	❒	❒	❒	❒

Please rate how satisfied you were with each of the following aspects of the workshop.	Not at all Satisfied	A Little Satisfied	Somewhat Satisfied	Very Satisfied	Extremely Satisfied
The organization of the workshop	❒	❒	❒	❒	❒
The facilitator(s) who led the workshop	❒	❒	❒	❒	❒
The workshop content	❒	❒	❒	❒	❒
Your overall satisfaction with the workshop	❒	❒	❒	❒	❒

As a result of today's workshop, are you *More Likely*, *Less Likely*, or *Equally Likely* to do the following:

	More Likely	Equally Likely	Less Likely
Teach your students about the origins of the universe	❒	❒	❒
Use technology to teach your students about the universe	❒	❒	❒
Watch a movie or TV program to learn more about the origins of the universe	❒	❒	❒
Visit a Web site to learn more about the origins of the universe	❒	❒	❒

Overall, what do you think will be most valuable to you from today's workshop?

What suggestions do you have for improving today's workshop?

Tell us a little about yourself.

Which role best characterizes you as an educator?
❒ general classroom teacher
❒ science teacher/specialist
❒ other; *describe* _____

What grade(s) are you teaching in the 2004-2005 school year?
□ Grades K-2 □ Grade 3-4 □ Grades 5-6 □ Grades 7-9 □ Grades 10-12

Are you currently teaching science? □ No □ Yes

If yes, how many days per week do you teach science? _____ days per week

What is the average length of your science lessons?
❒ <15 minutes ❒ 15-30 minutes ❒ 31-60 minutes ❒ >60 minutes

How many years have you taught science?
□ less than 1 year □ 1-3 yrs. □ 4-8 yr □ 9-15 yrs □ 10 + yrs.

Are you a: Male or Female (Circle one)

Thanks for your feedback!

Goodman Research Group, Inc. 30 JFK Street, Floor 3, Cambridge, MA 02138

APPENDIX H: PUBLIC VIEWER SURVEYS

Public Pre-Survey

Nova Origins Survey #1

For descriptive purposes, please tell us a little about yourself.

1. Are you: ❒ Female ❒ Male

2. In what year were you born? _____

3. How do you describe yourself? (Check all that apply)

- ❑ Caucasian or White
- ❑ Asian-American or Pacific Islander
- ❑ Latino or Hispanic
- ❑ Native American
- ❑ African-American or Black
- ❑ Other (describe) _____

4. What is the highest level of education that you've completed?

- ❒ Some high school
- ❒ High school diploma or GED
- ❒ Some college
- ❒Associate's degree/vocational certification
- ❒ Bachelor's degree; *major(s)* _____
- ❒ Master's degree; *field of study* _____
- ❒ Doctorate or Professional degree; *field of study* _____
- ❒ Other; *describe* _____

5. What is your occupation? _____

6. What is your total yearly household income?

- ❒ Under $20,000 a year
- ❒ Between $20,000 and $49,999 a year
- ❒ Between $50,000 and $74,999 a year
- ❒ $75,000 a year or more

7. What formal education have you completed in each of these science subject areas?
(Check all that apply)

	Astronomy	**Physics**	**Chemistry**	**Biology**	**Other Science**
No formal education	❑	❑	❑	❑	❑
High School course work	❑	❑	❑	❑	❑
Undergraduate college courses	❑	❑	❑	❑	❑
Graduate courses	❑	❑	❑	❑	❑
Post-graduate training	❑	❑	❑	❑	❑
Other training	❑	❑	❑	❑	❑

If you indicated an "other science" or "other training" for any of the above, please specify:

8. Circle the number that best describes your knowledge and interests in each area below.

How knowledgeable are you about:	Not at all knowledgeable	A little knowledgeable	Somewhat knowledgeable	Very knowledgeable	Extremely knowledgeable
The history of the earth's formation	1	2	3	4	5
How the universe evolved to permit the emergence of life on earth	1	2	3	4	5
The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

How interesting are the following topics to you:	Not at all interesting	A little interesting	Somewhat interesting	Very interesting	Extremely interesting
The history of the earth's formation	1	2	3	4	5
How the universe evolved to permit the emergence of life on earth	1	2	3	4	5
The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

9. Indicate (a) whether you have done any of the following in the past twelve months, and (b) how likely it is that you will do each activity in the next twelve months:

	In the past 12 months have you done this?	In the next 12 months how likely is it that you will do this?				
		Not at all likely		Somewhat likely		Extremely likely
Read a book about the history of the universe and/or life on earth	❑ Yes ❑ No	1	2	3	4	5
Watch a movie or TV program about the history of the universe and/or life on earth	❑ Yes ❑ No	1	2	3	4	5
Visit a Web site to learn about the history of the universe and/or life on earth	❑ Yes ❑ No	1	2	3	4	5
Visit a science museum or science center	❑ Yes ❑ No	1	2	3	4	5
Attend a lecture or presentation about the history of the universe and/or life on earth	❑ Yes ❑ No	1	2	3	4	5

10. How LIKELY are you to have a conversation with a friend in the near future about the following topics? (Circle one number per row.)

Topics	Not at all likely	A little likely	Somewhat likely	Very likely	Extremely likely
The history of the earth's formation	1	2	3	4	5
How the universe evolved to permit the emergence of life on earth	1	2	3	4	5
The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

11. How COMFORTABLE would you be having a conversation with a friend about the following topics? (Circle one number per row.)

Topics	Not at all comfortable	A little comfortable	Somewhat comfortable	Very comfortable	Extremely comfortable
The history of the earth's formation	1	2	3	4	5
How the universe evolved to permit the emergence of life on earth	1	2	3	4	5
The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

12. If you had a conversation with a friend about the following topics, how ACCURATE do you think your side of the conversation would be? (Circle one number per row.)

Topics	Not at all accurate	A little accurate	Somewhat accurate	Very accurate	Extremely accurate
The history of the earth's formation	1	2	3	4	5
How the universe evolved to permit the emergence of life on earth	1	2	3	4	5
The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

13. For the next set of questions, circle the correct answer. Don't worry if you do not know the answer to every question or even most of the questions. The questions are designed to be challenging. We are interested in finding out what you <u>currently</u> know about the Universe so please <u>DO NOT</u> consult the Internet, books, or other resources when answering the questions.

A. Why are electromagnetic fields important for planets?

a. Electromagnetic fields deflect the highly charged particles of the solar wind, so they protect the planet's atmosphere from being stripped away.
b. A planet's electromagnetic field helps hold it together.
c. Planets with electromagnetic fields can attract (or repel) other planets that also have electromagnetic fields.
d. Electromagnetic fields help birds and other migratory animals find their way.

B. In what order did the following seem to form?

a. Heavy elements in supernova, galaxies, sun, Big Bang, earth, and life.
b. Big Bang, galaxies, heavy elements in supernova, sun, earth, and life.
c. Big Bang, heavy elements in supernova, galaxies, sun, earth, and life.
d. Sun, Big Bang, galaxies, heavy elements in supernova, earth, and life.

C. What is the significance of finding life on earth in so many extreme conditions of temperature, acidity, and nutrients?

a. Each species could immediately adjust to and survive drastic environmental changes.
b. If life could thrive in so many different conditions, there is a greater chance that life could begin somewhere else in the universe, no matter what the environment.
c. All forms of life probably originated at the same time, regardless of local conditions.
d. The microbes must have come from many different places in the universe, one separate source for each environment on earth where they thrive.

D. How does the age of the moon compare to that of the earth?

a. The moon is 10 million years older.
b. They are both the same age.
c. The moon is about 50 million years younger.
d. The moon is about 1 billion years younger.

E. What instrument is used to determine the amounts of different chemical elements in a star or galaxy?

a. Infrared telescope.
b. Spectrograph.
c. Radio telescope.
d. Satellite.

F. How does a planet form?

a. A star cools down into one giant solid object, which then breaks apart into planets.
b. First, there are clouds of gas moving around near to each other. Then, the cloud in the middle gets hotter and becomes a star, but the others cool and solidify into planets.
c. A star ejects huge clouds of gas, which move out and cool into planets.
d. Little bits of dust stick together. They collide with others to form pebbles, then rocks, then boulders, and ultimately planets.

G. How does the process of photosynthesis benefit life on earth?

a. Microbial life uses the abundant energy from the sun to spread all over the earth.
b. The byproduct of photosynthesis is oxygen, which enables higher life forms.
c. The ozone form of oxygen in the upper atmosphere protects life from solar ultraviolet rays.
d. All of the above.

H. Why is it hard to detect alien signals?

a. We must scan so many stars, in so many directions in the sky, at so many possible frequencies.
b. Our computers would not be fast enough to keep up with the alien transmissions.
c. The alien signals would be in a code which humans couldn't understand.
d. Any signals from other planets are too weak because they are too far away.

I. What is the approximate age of the earth?

a. About 6000 years.
b. About 3 million years.
c. About 4.5 billion years.
d. About 10 billion years.

J. What does a planet need for microbes to evolve to intelligent life?

a. Time for complex animals to evolve, without catastrophes such as huge meteorites.
b. DNA, for replication but with some mutations.
c. Large areas of dry land in order for intelligent life to establish a stable foundation.
d. A continuously increasing supply of oxygen.

K. What is the evidence that the Big Bang occurred?

a. We see galaxies moving away from each other.
b. Objects in the universe travel at high speed.
c. The entire sky is filled with the faint glow of microwave radiation.
d. Objects in space are still colliding with each other.

L. What element has the most flexibility for forming compounds and as a result is very important for life?

a. Carbon.
b. Oxygen.
c. Nitrogen.
d. Hydrogen.

M. Which of the following statements about origins of the universe, stars, planets, and life is most likely to be true?

a. We can never learn about these origins, because it all happened too long ago.
b. Scientists in all generations continuously develop new technology and theories which expand our knowledge and understanding about these origins.
c. We can't be sure about the origins of such cosmic things, so we can only trust our own beliefs.
d. Scientists are very close to being able to explain everything about these origins, with no remaining doubts.

14. How challenging were the previous questions for you to answer?

❑	❑	❑	❑	❑
Not at all challenging	Only a little challenging	Moderately challenging	Very challenging	Extremely challenging

15. How often did you have to guess when selecting the correct answer for the previous 13 questions?

❑	❑	❑	❑	❑
Didn't guess on any question	Guessed on 1-4 questions	Guessed on 5-8 questions	Guessed on 9-12 questions	Guessed on every question

Thank you for your completing this survey!

Please return your completed survey to Goodman Research Group.
Once we receive your survey, you will receive the ORIGINS videos in the mail in a few days.

Participant ID:

Public Post-Survey

Nova Origins Survey # 2

1. How much of the Origins series (Parts 1 and 2) did you watch?

Origins Part 1 (Hours 1 and 2)
- ❑ I watched the entire DVD/Video
- ❑ I watched some of the DVD/Video
- ❑ I didn't watch the DVD/Video

Origins Part 2 (Hours 3 and 4)
- ❑ I watched the entire DVD/Video
- ❑ I watched some of the DVD/Video
- ❑ I didn't watch the DVD/Video

2. How many times did you watch Origins (Parts 1 and 2)?

Origins Part 1 (Hours 1 and 2)
- ❑ I didn't watch the DVD/Video
- ❑ One time
- ❑ More than one time (how many:)

Origins Part 2 (Hours 3 and 4)
- ❑ I didn't watch the DVD/Video
- ❑ One time
- ❑ More than one time (how many:)

3. Did you have a preference for Part 1 or Part 2?

- ❑ I had no preference for one over the other.
- ❑ I preferred Part 1
- ❑ I preferred Part 2

Please explain your response if you had a preference for one part over the other.

4. Rate how much you agree with the following statements about Origins. (Circle one number per row.)

	Completely disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Completely agree
Origins was interesting	1	2	3	4	5
The information was presented clearly	1	2	3	4	5

5. How likely are you to do the following: (Circle one number per row.)

	Not at all likely	A little likely	Somewhat likely	Very likely	Extremely likely
Watch Origins again if given the opportunity	1	2	3	4	5
Recommend Origins to others	1	2	3	4	5

Next ↳

6. How much did you learn from Origins about the following topics? (Mark one box per line.)

How much did you learn about:	Nothing	A little	Some	A lot
The history of the earth's formation	❑	❑	❑	❑
How the universe evolved to permit the emergence of life on earth	❑	❑	❑	❑
The likelihood that there is life beyond earth	❑	❑	❑	❑
The tools and techniques scientists use to study the universe	❑	❑	❑	❑

7. What was the most important thing you learned from the Origins program?

8. As a result of watching the Origins program, are you <u>more</u>, <u>equally</u>, or <u>less</u> likely to do the following in the next year: (Mark one box per line.)

	More likely	Equally likely	Less likely
Read a book about the history of the universe and/or life on earth	❑	❑	❑
Watch a movie or TV program about the history of the universe and/or life on earth	❑	❑	❑
Visit a Web site to learn about the history of the universe and/or life on earth	❑	❑	❑
Visit a science museum or science center	❑	❑	❑
Attend a lecture or presentation about the history of the universe and/or life on earth	❑	❑	❑

9. What, if anything, would you change about the Origins program so that you learned more?

10. How LIKELY are you to have a conversation with a friend in the near future about the following topics? (Circle one number per row.)

Topics	Not at all likely	A little likely	Somewhat likely	Very likely	Extremely likely
The history of the earth's formation	1	2	3	4	5
How the universe evolved to permit the emergence of life on earth	1	2	3	4	5
The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

11. How COMFORTABLE would you be having a conversation with a friend about the following topics? (Circle one number per row.)

Topics	Not at all comfortable	A little comfortable	Somewhat comfortable	Very comfortable	Extremely comfortable
The history of the earth's formation	1	2	3	4	5
How the universe evolved to permit the emergence of life on earth	1	2	3	4	5
The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

12. If you had a conversation with a friend about the following topics, how ACCURATE do you think your side of the conversation would be? (Circle one number per row.)

Topics	Not at all accurate	A little accurate	Somewhat accurate	Very accurate	Extremely accurate
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The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

Next ↳

13. For the next set of questions, circle the correct answer. Don't worry if you do not know the answer to every question or even most of the questions. The questions are designed to be challenging. We are interested in finding out what you <u>currently</u> know about the Universe so please <u>DO NOT</u> consult the Internet, books, or other resources when answering the questions.

A. How does a planet form?

e. A star cools down into one giant solid object, which then breaks apart into planets.
f. First, there are clouds of gas moving around near to each other. Then, the cloud in the middle gets hotter and becomes a star, but the others cool and solidify into planets.
g. A star ejects huge clouds of gas, which move out and cool into planets.
h. Little bits of dust stick together. They collide with others to form pebbles, then rocks, then boulders, and ultimately planets.

B. Why are electromagnetic fields important for planets?

e. Electromagnetic fields deflect the highly charged particles of the solar wind, so they protect the planet's atmosphere from being stripped away.
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g. The entire sky is filled with the faint glow of microwave radiation.
h. Objects in space are still colliding with each other.

D. What element has the most flexibility for forming compounds and as a result is very important for life?

e. Carbon.
f. Oxygen.
g. Nitrogen.
h. Hydrogen.

E. In what order did the following seem to form?

e. Heavy elements in supernova, galaxies, sun, Big Bang, earth, and life.
f. Big Bang, galaxies, heavy elements in supernova, sun, earth, and life.
g. Big Bang, heavy elements in supernova, galaxies, sun, earth, and life.
d. Sun, Big Bang, other galaxies, heavy elements in supernova, earth, and life.

F. How does the process of photosynthesis benefit life on earth?

e. Microbial life uses the abundant energy from the sun to spread all over the earth.
f. The byproduct of photosynthesis is oxygen, which enables higher life forms.
g. The ozone form of oxygen in the upper atmosphere protects life from solar ultraviolet rays.
h. All of the above.

G. Why is it hard to detect alien signals?

e. We must scan so many stars, in so many directions in the sky, at so many possible frequencies.
f. Our computers would not be fast enough to keep up with the alien transmissions.
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h. Any signals from other planets are too weak because they are too far away.

H. What is the approximate age of the earth?

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f. About 3 million years.
g. About 4.5 billion years.
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I. What is the significance of finding life on earth in so many extreme conditions of temperature, acidity, and nutrients?

e. Each species could immediately adjust to and survive drastic environmental changes.
f. If life could thrive in so many different conditions, there is a greater chance that life could begin somewhere else in the universe, no matter what the environment.
g. All forms of life probably originated at the same time, regardless of local conditions.
h. The microbes must have come from many different places in the universe, one separate source for each environment on earth where they thrive.

J. How does the age of the moon compare to that of the earth?

e. The moon is 10 million years older.
f. They are both the same age.
g. The moon is about 50 million years younger.
h. The moon is about 1 billion years younger.

K. What does a planet need for microbes to evolve to intelligent life?

e. Time for complex animals to evolve, without catastrophes such as huge meteorites.
f. DNA, for replication but with some mutations.
g. Large areas of dry land in order for intelligent life to establish a stable foundation.
h. A continuously increasing supply of oxygen.

L. Which of the following statements about origins of the universe, stars, planets, and life is most likely to be true?

e. We can never learn about these origins, because it all happened too long ago.
f. Scientists in all generations continuously develop new technology and theories which expand our knowledge and understanding about these origins.
g. We can't be sure about the origins of such cosmic things, so we can only trust our own beliefs.
h. Scientists are very close to being able to explain everything about these origins, with no remaining doubts.

M. What instrument is used to determine the amounts of different chemical elements in a star or galaxy?

e. Infrared telescope.
f. Spectrograph.
g. Radio telescope.
h. Satellite.

14. How challenging were the previous questions for you to answer?

❑	❑	❑	❑	❑
Not at all challenging	A little challenging	Somewhat challenging	Very challenging	Extremely challenging

15. How often did you have to guess when selecting the correct answer for the previous 13 questions?

❑	❑	❑	❑	❑
Didn't guess on any question	Guessed on 1-4 questions	Guessed on 5-8 questions	Guessed on 9-12 questions	Guessed on every question

Thank you for your completing this survey!

Please return your completed survey to Goodman Research Group.
You will receive your stipend in the mail a few days after we receive your survey.

30 JFK Street, Floor 3, Cambridge, MA 02138

APPENDIX I: STUDENT VIEWER SURVEYS

Student Pre-Survey

Dear Student,

You have received this survey because Goodman Research Group, Inc. is interested in finding out how knowledgeable and interested you are in topics relating to the origins of earth and life. After finishing this survey you will watch the first half of the NOVA program, *Origins*, and then you will complete another survey similar to this one. Your feedback will help NOVA understand how the program impacts high school students.

To insure confidentiality, please give your birth date as an identification code, instead of your name. This way we can track responses from both surveys. All information will be kept confidential.

What is your DATE OF BIRTH? : __ __ / __ __ / __ __ __ __

Birth Month / Day / Birth Year

For descriptive purposes, please tell us a little about yourself.

1. Are you: ❒ Female ❒ Male

2. How do you describe yourself? (Check all that apply)

- ❑ Caucasian or White
- ❑ Latino or Hispanic
- ❑ African-American or Black
- ❑ Asian-American or Pacific Islander
- ❑ Native American
- ❑ Other (describe) _____

3. What grade are you in? _____

What is the subject area of the class that you are taking this survey for? _____

4. Which of the following have you studied in school? (Check all that apply)

- ❑ Astronomy
- ❑ Biology
- ❑ Chemistry
- ❑ Physics
- ❑ Other science (specify):_____

5. Circle the number that best describes your knowledge and interests in each area below.

How knowledgeable are you about:	**Not at all knowledgeable**	**A little knowledgeable**	**Somewhat knowledgeable**	**Very knowledgeable**	**Extremely knowledgeable**
The history of the earth's formation	1	2	3	4	5
How the universe evolved to permit the emergence of life on earth	1	2	3	4	5
The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

How interesting are the following topics to you:	Not at all interesting	A little interesting	Somewhat interesting	Very interesting	Extremely interesting
The history of the earth's formation	1	2	3	4	5
How the universe evolved to permit the emergence of life on earth	1	2	3	4	5
The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

6. Indicate (a) whether you have done any of the following in the past twelve months, and (b) how likely it is that you will do each activity in the next twelve months:

	In the past 12 months have you done this?	In the next 12 months, how likely is it that you will do this?				
		Not at all likely		*Somewhat likely*		*Extremely likely*
Read a book about the history of the universe and/or life on earth	❑ Yes ❑ No	1	2	3	4	5
Watch a movie or TV program about the history of the universe and/or life on earth	❑ Yes ❑ No	1	2	3	4	5
Visit a Web site to learn about the history of the universe and/or life on earth	❑ Yes ❑ No	1	2	3	4	5
Visit a science museum or science center	❑ Yes ❑ No	1	2	3	4	5
Attend a lecture or presentation about the history of the universe and/or life on earth	❑ Yes ❑ No	1	2	3	4	5

7. How LIKELY are you to have a conversation with a friend in the near future about the following topics? (Circle one number per row.)

Topics	Not at all likely	A little likely	Somewhat likely	Very likely	Extremely likely
The history of the earth's formation	1	2	3	4	5
How the universe evolved to permit the emergence of life on earth	1	2	3	4	5
The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

8. How <u>COMFORTABLE</u> would you be having a conversation with a friend about the following topics?
(Circle one number per row.)

Topics	Not at all comfortable	A little comfortable	Somewhat comfortable	Very comfortable	Extremely comfortable
The history of the earth's formation	1	2	3	4	5
How the universe evolved to permit the emergence of life on earth	1	2	3	4	5
The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

9. If you had a conversation with a friend about the following topics, how <u>ACCURATE</u> do you think your side of the conversation would be? (Circle one number per row.)

Topics	Not at all accurate	A little accurate	Somewhat accurate	Very accurate	Extremely accurate
The history of the earth's formation	1	2	3	4	5
How the universe evolved to permit the emergence of life on earth	1	2	3	4	5
The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

10. Have you ever watched a TV program on PBS called *Origins*?

❑ Yes ❑ No ❑ I don't know

11. For the next set of questions, circle the correct answer. Don't worry if you do not know the answer to every question or even most of the questions. The questions are designed to be challenging.We are interested in finding out what you <u>currently</u> know about the Universe so please <u>DO NOT</u> consult the Internet, books, or other resources when answering the questions.

A. Why are electromagnetic fields important for planets?

i. Electromagnetic fields deflect the highly charged particles of the solar wind, so they protect the planet's atmosphere from being stripped away.
j. A planet's electromagnetic field helps hold it together.
k. Planets with electromagnetic fields can attract (or repel) other planets that also have electromagnetic fields.
l. Electromagnetic fields help birds and other migratory animals find their way.

B. In what order did the following seem to form?

h. Heavy elements in supernova, galaxies, sun, Big Bang, earth, and life.
i. Big Bang, galaxies, heavy elements in supernova, sun, earth, and life.
j. Big Bang, heavy elements in supernova, galaxies, sun, earth, and life.
k. Sun, Big Bang, other galaxies, heavy elements in supernova, earth, and life.

C. What is the significance of finding life on earth in so many extreme conditions of temperature, acidity, and nutrients?

i. Each species could immediately adjust to and survive drastic environmental changes.
j. If life could thrive in so many different conditions, there is a greater chance that life could begin somewhere else in the universe, no matter what the environment.
k. All forms of life probably originated at the same time, regardless of local conditions.
l. The microbes must have come from many different places in the universe, one separate source for each environment on earth where they thrive.

D. How does the age of the moon compare to that of the earth?

i. The moon is 10 million years older.
j. They are both the same age.
k. The moon is about 50 million years younger.
l. The moon is about 1 billion years younger.

E. What instrument is used to determine the amounts of different chemical elements in a star or galaxy?

i. Infrared telescope.
j. Spectrograph.
k. Radio telescope.
l. Satellite.

F. How does a planet form?

i. A star cools down into one giant solid object, which then breaks apart into planets.
j. First, there are clouds of gas moving around near to each other. Then, the cloud in the middle gets hotter and becomes a star, but the others cool and solidify into planets.
k. A star ejects huge clouds of gas, which move out and cool into planets.
l. Little bits of dust stick together. They collide with others to form pebbles, then rocks, then boulders, and ultimately planets.

G. How does the process of photosynthesis benefit life on earth?

i. Microbial life uses the abundant energy from the sun to spread all over the earth.
j. The byproduct of photosynthesis is oxygen, which enables higher life forms.
k. The ozone form of oxygen in the upper atmosphere protects life from solar ultraviolet rays.
l. All of the above.

H. Why is it hard to detect alien signals?

i. We must scan so many stars, in so many directions in the sky, at so many possible frequencies.
j. Our computers would not be fast enough to keep up with the alien transmissions.
k. The alien signals would be in a code which humans couldn't understand.
l. Any signals from other planets are too weak because they are too far away.

I. What is the approximate age of the earth?

i. About 6000 years.
j. About 3 million years.
k. About 4.5 billion years.
l. About 10 billion years.

J. What does a planet need for microbes to evolve to intelligent life?

i. Time for complex animals to evolve, without catastrophes such as huge meteorites.
j. DNA, for replication but with some mutations.
k. Large areas of dry land in order for intelligent life to establish a stable foundation.
l. A continuously increasing supply of oxygen.

K. What is the evidence that the Big Bang occurred?

i. We see galaxies moving away from each other.
j. Objects in the universe travel at high speed.
k. The entire sky is filled with the faint glow of microwave radiation.
l. Objects in space are still colliding with each other.

L. What element has the most flexibility for forming compounds and as a result is very important for life?

i. Carbon.
j. Oxygen.
k. Nitrogen.
l. Hydrogen.

M. Which of the following statements about origins of the universe, stars, planets, and life is most likely to be true?

i. We can never learn about these origins, because it all happened too long ago.
j. Scientists in all generations continuously develop new technology and theories which expand our knowledge and understanding about these origins.
k. We can't be sure about the origins of such cosmic things, so we can only trust our own beliefs.
l. Scientists are very close to being able to explain everything about these origins, with no remaining doubts.

12. How challenging were the previous questions for you to answer?

❑	❑	❑	❑	❑
Not at all challenging	Only a little challenging	Moderately challenging	Very challenging	Extremely challenging

13. How often did you have to guess when selecting the correct answer for the previous 13 questions?

❑	❑	❑	❑	❑
Didn't guess on any question	Guessed on 1-4 questions	Guessed on 5-8 questions	Guessed on 9-12 questions	Guessed on every question

Thank you for your completing this survey!

Please return your completed survey to your teacher.

Student Post-Survey

To insure confidentiality, please give your birth date as an identification code, instead of your name. This way we can track responses from both surveys. All information will be kept confidential.

What is your DATE OF BIRTH? : __ __ / __ __ / __ __ __ __
Birth Month / Day / Birth Year

1. How much of the Origins program did you watch? (Mark only one box.)

❑ I watched the first and second hour of the program
❑ I watched only the first hour of the program
❑ I watched only the second hour of the program
❑ I didn't watch any part of the program
❑ Other (specify):

2. Rate how much you agree with the following statements about Origins. (Circle one number per row.)

	Completely disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Completely agree
Origins was interesting	1	2	3	4	5
The information was presented clearly	1	2	3	4	5

3. How likely are you to do the following: (Circle one number per row.)

	Not at all likely	A little likely	Somewhat likely	Very likely	Extremely likely
Watch Origins again if given the opportunity	1	2	3	4	5
Recommend Origins to others	1	2	3	4	5

4. How much did you learn from Origins about the following topics? (Mark one box per line.)

How much did you learn about:	Nothing	A little	Some	A lot
The history of the earth's formation	❑	❑	❑	❑
How the universe evolved to permit the emergence of life on earth	❑	❑	❑	❑
The likelihood that there is life beyond earth	❑	❑	❑	❑
The tools and techniques scientists use to study the universe	❑	❑	❑	❑

5. What was the most important thing you learned from the Origins program?

6. As a result of watching the Origins program, are you <u>more</u>, <u>equally</u>, or <u>less</u> likely to do the following in the next year: (Mark one box per line.)

	More likely	Equally likely	Less likely
Read a book about the history of the universe and/or life on earth	❑	❑	❑
Watch a movie or TV program about the history of the universe and/or life on earth	❑	❑	❑
Visit a Web site to learn about the history of the universe and/or life on earth	❑	❑	❑
Visit a science museum or science center	❑	❑	❑
Attend a lecture or presentation about the history of the universe and/or life on earth	❑	❑	❑

7. What, if anything, would you change about the Origins program so that you learned more?

8. How LIKELY are you to have a conversation with a friend in the near future about the following topics? (Circle one number per row.)

Topics	Not at all likely	A little likely	Somewhat likely	Very likely	Extremely likely
The history of the earth's formation	1	2	3	4	5
How the universe evolved to permit the emergence of life on earth	1	2	3	4	5
The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

9. How COMFORTABLE would you be having a conversation with a friend about the following topics? (Circle one number per row.)

Topics	Not at all comfortable	A little comfortable	Somewhat comfortable	Very comfortable	Extremely comfortable
The history of the earth's formation	1	2	3	4	5
How the universe evolved to permit the emergence of life on earth	1	2	3	4	5
The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

10. If you had a conversation with a friend about the following topics, how ACCURATE do you think your side of the conversation would be? (Circle one number per row.)

Topics	Not at all accurate	A little accurate	Somewhat accurate	Very accurate	Extremely accurate
The history of the earth's formation	1	2	3	4	5
How the universe evolved to permit the emergence of life on earth	1	2	3	4	5
The likelihood that there is life beyond earth	1	2	3	4	5
The tools and techniques scientists use to study the universe	1	2	3	4	5

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11. For the next set of questions, circle the correct answer. Don't worry if you do not know the answer to every question or even most of the questions. The questions are designed to be challenging. We are interested in finding out what you <u>currently</u> know about the Universe so please <u>DO NOT</u> consult the Internet, books, or other resources when answering the questions.

A. How does a planet form?

m. A star cools down into one giant solid object, which then breaks apart into planets.
n. First, there are clouds of gas moving around near to each other. Then, the cloud in the middle gets hotter and becomes a star, but the others cool and solidify into planets.
o. A star ejects huge clouds of gas, which move out and cool into planets.
p. Little bits of dust stick together. They collide with others to form pebbles, then rocks, then boulders, and ultimately planets.

B. Why are electromagnetic fields important for planets?

m. Electromagnetic fields deflect the highly charged particles of the solar wind, so they protect the planet's atmosphere from being stripped away.
n. A planet's electromagnetic field helps hold it together.
o. Planets with electromagnetic fields can attract (or repel) other planets that also have electromagnetic fields.
p. Electromagnetic fields help birds and other migratory animals find their way.

C. What is the evidence that the Big Bang occurred?

m. We see galaxies moving away from each other.
n. Objects in the universe travel at high speed.
o. The entire sky is filled with the faint glow of microwave radiation.
p. Objects in space are still colliding with each other.

D. What element has the most flexibility for forming compounds and as a result is very important for life?

m. Carbon.
n. Oxygen.
o. Nitrogen.
p. Hydrogen.

E. In what order did the following seem to form?

l. Heavy elements in supernova, galaxies, sun, Big Bang, earth, and life.
m. Big Bang, galaxies, heavy elements in supernova, sun, earth, and life.
n. Big Bang, heavy elements in supernova, galaxies, sun, earth, and life.
d. Sun, Big Bang, other galaxies, heavy elements in supernova, earth, and life.

F. How does the process of photosynthesis benefit life on earth?

m. Microbial life uses the abundant energy from the sun to spread all over the earth.
n. The byproduct of photosynthesis is oxygen, which enables higher life forms.
o. The ozone form of oxygen in the upper atmosphere protects life from solar ultraviolet rays.
p. All of the above.

G. Why is it hard to detect alien signals?

m. We must scan so many stars, in so many directions in the sky, at so many possible frequencies.
n. Our computers would not be fast enough to keep up with the alien transmissions.
o. The alien signals would be in a code which humans couldn't understand.
p. Any signals from other planets are too weak because they are too far away.

H. What is the approximate age of the earth?

m. About 6000 years.
n. About 3 million years.
o. About 4.5 billion years.
p. About 10 billion years.

I. What is the significance of finding life on earth in so many extreme conditions of temperature, acidity, and nutrients?

m. Each species could immediately adjust to and survive drastic environmental changes.
n. If life could thrive in so many different conditions, there is a greater chance that life could begin somewhere else in the universe, no matter what the environment.
o. All forms of life probably originated at the same time, regardless of local conditions.
p. The microbes must have come from many different places in the universe, one separate source for each environment on earth where they thrive.

J. How does the age of the moon compare to that of the earth?

m. The moon is 10 million years older.
n. They are both the same age.
o. The moon is about 50 million years younger.
p. The moon is about 1 billion years younger.

K. What does a planet need for microbes to evolve to intelligent life?

m. Time for complex animals to evolve, without catastrophes such as huge meteorites.
n. DNA, for replication but with some mutations.
o. Large areas of dry land in order for intelligent life to establish a stable foundation.
p. A continuously increasing supply of oxygen.

L. Which of the following statements about origins of the universe, stars, planets, and life is most likely to be true?

m. We can never learn about these origins, because it all happened too long ago.
n. Scientists in all generations continuously develop new technology and theories which expand our knowledge and understanding about these origins.
o. We can't be sure about the origins of such cosmic things, so we can only trust our own beliefs.
p. Scientists are very close to being able to explain everything about these origins, with no remaining doubts.

M. What instrument is used to determine the amounts of different chemical elements in a star or galaxy?

m. Infrared telescope.
n. Spectrograph.
o. Radio telescope.
p. Satellite.

12. How challenging were the previous questions for you to answer?

❑	❑	❑	❑	❑
Not at all challenging	A little challenging	Somewhat challenging	Very challenging	Extremely challenging

13. How often did you have to guess when selecting the correct answer for the previous 13 questions?

❑	❑	❑	❑	❑
Didn't guess on any question	Guessed on 1-4 questions	Guessed on 5-8 questions	Guessed on 9-12 questions	Guessed on every question

Thank you for your completing this survey!

Please return your completed survey to your teacher.

APPENDIX J: TEACHER SURVEY

1. How much of the Origins program did you show to your class? (Mark only one box.)

❑ The first and second hour of the program
❑ Only the first hour of the program
❑ Only the second hour of the program
❑ Didn't show any part of the program
❑ Other (specify):

2. Rate how much you agree with the following statements about Origins. (Circle one number per row.)

	Completely disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Completely agree
Origins was interesting	1	2	3	4	5
The information was presented clearly	1	2	3	4	5

3. How likely are you to do the following: (Circle one number per row.)

	Not at all likely	A little likely	Somewhat likely	Very likely	Extremely likely
Watch Origins again if given the opportunity	1	2	3	4	5
Recommend Origins to others	1	2	3	4	5

4. How much do you think students learned from Origins about the following topics? (Mark one box per line.)

How much did students learn about:	Nothing	A little	Some	A lot
The history of the earth's formation	❑	❑	❑	❑
How the universe evolved to permit the emergence of life on earth	❑	❑	❑	❑
The likelihood that there is life beyond earth	❑	❑	❑	❑
The tools and techniques scientists use to study the universe	❑	❑	❑	❑

7. What do you think was the most important thing your students learned from the Origins program?

8. As a result of watching the Origins program, do you think your students are more, equally, or less likely to do the following in the next year: (Mark one box per line.)

	More likely	Equally likely	Less likely
Read a book about the history of the universe and/or life on earth	❑	❑	❑
Watch a movie or TV program about the history of the universe and/or life on earth	❑	❑	❑
Visit a Web site to learn about the history of the universe and/or life on earth	❑	❑	❑
Visit a science museum or science center	❑	❑	❑
Attend a lecture or presentation about the history of the universe and/or life on earth	❑	❑	❑

9. What, if anything, would you change about the Origins program so that students learned more?

Thank you for your completing this survey!

Please return the surveys to GRG in the pre-paid FedEx envelope provided to you.

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