



From Museum to Refugee Camp

1001 Inventions and 1001 Meals

Eric Siegel, Hanan Dowidar

Excited child after he receives his World Food Programme healthy snack and 1001 Inventions book at the end of a 1001 Meals event at his refugee camp.



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In 2010, the United Kingdom-based nonprofit organization, 1001 Inventions,¹ opened an interactive traveling exhibition at the London Science Museum. Titled *1001 Inventions*, the exhibition celebrates the scientific contributions of the multicultural Muslim civilization that extended from Spain to China from the 7th to the 17th century. The exhibition was initiated to address gaps in public understanding of the history

sense of urgency in the museum community to address the profound inequities that face our cities, countries, and the world. At the same time, a growing alienation from the global scientific enterprise, fueled by widely disseminated misinformation, is impeding efforts to mitigate climate change and the pandemic. In forums, conferences, videoconferences, and online media, museums have been searching for impact and relevance to meet these needs.⁴

The *1001 Inventions* exhibition and accompanying programs focus upon public outreach to engage people's interest in science while promoting diversity and intercultural appreciation.

of science and help promote intercultural appreciation, diversity, and inclusion.

The success of the exhibition, which as of 2021 has traveled to 40 cities around the world and been seen by more than 15 million people, has supported the creation of a new program called 1001 Meals.² Created in partnership with the World Food Programme (WFP),³ 1001 Meals provides a holistic approach to the wellbeing of vulnerable Syrian children living in Jordanian refugee camps by offering them healthy meals coupled with themes, elements, and activities from *1001 Inventions*.

Increasingly, museums are striving to have an impact beyond their walls to address profound social and economic inequity. The global COVID-19 pandemic that began in 2020 has only accelerated a looming

This urgent conversation has inconsistently fomented changes in collections, exhibitions, programming, and staffing, and the core missions of museums and of exhibitions frequently seem remote from the global plagues of ignorance, poverty, racism, xenophobia, and violence. Together, *1001 Inventions* and 1001 Meals demonstrate that programs grounded in museum exhibitions and education can harness creativity, content, and entrepreneurial spirit to build a powerful intervention into one of the world's great humanitarian crises.

Because the coauthors have had different experiences with these projects, Eric Siegel, who brought the exhibition to the New York Hall of Science (NYSCI) for its United States premier in 2010, addresses the exhibition-centric components of the project and Hanan Dowidar, who coordinated

the partnerships that enabled the 1001 Meals project, contributes the content of the 1001 Meals work, as well as some of the institutional challenges of this complex project. Eric Siegel then concludes this article by contextualizing the exhibition and meals programs within the framework of contemporary museum engagement.

The 1001 Inventions Exhibition

The *1001 Inventions* exhibition is one component of the 1001 Inventions' organizational initiatives. These initiatives aim to spark young people's interest in science while promoting appreciation for people of all cultures and backgrounds; they do so by demonstrating humankind's shared scientific heritage.⁵ The content of *1001 Inventions* is grounded in robust research by a global network of leading academics. The network of scholars of the Foundation for Science, Technology and Civilisation (FSTC),⁶ 1001 Inventions' academic partner, provides the latest research – work that has been debated and peer reviewed by credible experts within the worldwide academic community – to help shape the narratives for 1001 Inventions productions.

The *1001 Inventions* exhibition and accompanying programs focus upon public outreach to engage people's interest in science while promoting diversity and intercultural appreciation. The 1001 Inventions' initiatives feature interactive exhibits, films, immersive live shows, hands-on workshops, digital content, books, and curricular material designed for family audiences. For this section, we will focus upon the *1001 Inventions* exhibition and programming directly related to it.

The fundamental thesis of *1001 Inventions* is that the Muslim civilization was both the repository of preexisting scientific knowledge and a locus of scientific innovation during the European “dark ages.”⁷ By foregrounding ethnically and religiously diverse scientists during the golden age of Arabic science, the exhibition intends to raise consciousness about the richness and diversity of Muslim civilization.⁸

The exhibition is structured around themes that were chosen to connect millennium-old discoveries with contexts familiar to visitors:

Home: The thousand-year-old inventions that still shape everyday life

Market: How influential ideas spread through travel and trade

School: Learning, libraries, and their links with the past

Hospital: How ancient approaches to health have influenced today's medicine

Town: Why East and West share so much architectural heritage

World: The explorers of 1,000 years ago

Universe: How ancient astronomers expanded our view of the universe

Nature: The natural world as seen through the eyes of a ninth-century explorer

Each of the thematic areas in the exhibition is focused around a particular discovery or set of inventions. Each thematic area includes a “Meet the Scholar” introductory



video with an actor presenting a pioneer from the golden age of Muslim civilization who is associated with the topic. The video monitors are placed in portrait mode, making them taller than wide so the actors fill the screen and appear to be nearly life-sized. When there are no visitors in front of the monitor, the monitor displays a loop of the actor making cheerful inviting gestures. When people gather, it seamlessly changes to the short introductory talk. Observation showed this simple design choice to be extremely effective, as it made it almost impossible for visitors to walk through the exhibition without seeing these onscreen scholars beckoning for their attention.⁹

The centerpiece of the exhibition is a replica of the water-powered “elephant clock” created by 13th-century engineering pioneer Al-Jazari. Some 20 feet tall and richly detailed, the elephant clock is the “Instagram moment” of the exhibition that authentically embodies a revelatory story of invention and ingenious engineering (fig. 1).

To create the exhibition, the development team made an extraordinary investment in materials, design, and media. Along with the videos mentioned earlier, the introductory film, *1001 Inventions and the Library of Secrets*,¹⁰ stars acclaimed actor Ben Kingsley as Al-Jazari; in it, young British school children and “magical” effects capture the feeling and engagement of the Harry Potter

Fig. 1. The centerpiece of the *1001 Inventions* exhibition, here shown installed at the NY Hall of Science, is a beautiful recreation of the elephant clock created by 13th-century engineer Al-Jazari.

films. We saw many visitors of all ages remain enthralled for the full 13 minutes of the film, and the production has won several international film awards, including the Gold Award for Educational Film at Cannes 2010 and the Grand Award for Best Film at the New York Film Festival that same year.

The exhibition and related resources feature scientists of all faiths, and highlight ethnic and gender diversity by featuring people of Jewish and Chinese descent, including women, who illuminate the breadth of the scientific enterprise during this golden age. Ahmed Salim, 1001 Inventions co-founder and director, who led the production and promotion of the exhibition, asserted that it was created for “people of all faiths and no faith.”¹¹ The web presence of 1001 Inventions and the accompanying publication *1001 Inventions: Muslim Heritage in Our World* are rich with both original and bibliographic research that demonstrates a nuanced and scholarly foundation for the exhibition and related programs.¹²

Studies conducted at the Science Museum of London showed a great influx of families that identified as Muslim (42 percent), many of whom were first time visitors (46 percent). In London, the exhibition expanded audience outside the Muslim community attracting ethnically diverse visitors with two-thirds from underrepresented, underserved audiences including Black, Asian, and minority ethnic communities in London and surrounding areas. Qualitative evaluation of the exhibition at the London Science Museum captured pride in Muslim heritage and, among non-Muslim visitors, surprise and enthusiasm for their newly acquired knowledge about the scientific contributions portrayed in the exhibition.¹³

Since 2010, the 1001 Inventions team has refined the exhibition and built multiple copies that have been traveling across the world, with an estimated 15 million visitors as of mid-2021. To complement this global reach, local educator resources have been shared widely on the Web.¹⁴ The 1001 Inventions team has been traveling tirelessly, creating new exhibitions, research, and public programming, and building invaluable relationships with such global organizations as the United Nations and regional non-governmental organizations (NGOs).

1001 Inventions at the NY Hall of Science

While working as Director and Chief Content Officer at the NY Hall of Science, I (Eric Siegel) heard about *1001 Inventions* from colleagues at the Science Museum of London, who had been working with the originators of the exhibition to bring it to its final form as an 8,000-square-foot exhibition. After several discussions with the show’s producers, NYSCI agreed to host its United States premiere.

Our impetus to host the exhibition was first and foremost to address the diversity of our audience. Queens has long been the epicenter of immigration to the United States; more than 100 languages are spoken in the neighborhoods immediately surrounding NYSCI. While the census does not document religious affiliation, it is estimated that 700,000 New Yorkers are Muslim.¹⁵ When NYSCI opened the exhibition in 2010, this population was subjected to persistent hostility, including vitriolic protests against creating an Islamic community center in lower Manhattan, which the media referred to as the Ground

Zero Mosque.¹⁶ While the staff and leadership were committed to presenting the exhibition, we were aware that we might face controversy for hosting an exhibition honoring the historical accomplishments of the Muslim civilization.

1001 Meals draws upon materials developed for *1001 Inventions* to create educational programming for – and foster community-building among – a desperately underserved population: displaced Syrians living in refugee camps.

While some press coverage focused on potential controversies,¹⁷ none of this affected the exhibition’s public reception at NYSCI. While NYSCI’s audience is always extraordinarily diverse, *1001 Inventions* contributed significantly to attracting audiences from the region’s large Muslim population. In order to support this new influx, we created a quiet prayer room for observant individuals, families, and school groups, a first in NYSCI’s history.

The museum also leveraged the diversity of its “Explainers,” high-school and college-age floor interpretive staff, to create a lively costumed interpretation program, scripts of which were shared with later venues for the

exhibition. This particularly successful aspect of the exhibition, along with programmatic activity created by the *1001 Inventions* developers, would later become part of the educational programming for the 1001 Meals project.

From the first contact between the NY Hall of Science and the 1001 Inventions team, museum staff members were impressed with the vision, focus, and generosity of the exhibition and team. At a time when hostility to the Muslim community was emerging in the United States and the West in general, the ecumenical spirit, commitment to well-grounded research, and first-rate design presaged the global success of the project.

1001 Meals

The success of the *1001 Inventions* exhibition generated sufficient revenue to support new initiatives, including 1001 Meals, the second focus of this article. 1001 Meals draws upon materials developed for *1001 Inventions* to create educational programming for – and foster community-building among – a desperately underserved population: displaced Syrians living in refugee camps.¹⁸ In partnership with the World Food Programme,¹⁹ it also provides a holistic and healthy food program for the camps, where food insecurity is high. (Note: the 1001 Meals program was suspended in the camps beginning in March 2020 due to the pandemic, it will resume when conditions are deemed safe.)

The decade-old civil war in Syria has resulted in the dislocation of 665,000 refugees to camps in neighboring Jordan and a growing diaspora of emigration throughout the region and beyond.²⁰ One of the great centers of

learning for millennia – in fact, the home of some of the most prominent scientists featured in *1001 Inventions* – Syria is suffering real-time collapse as warfare reduces the capital (Damascus) and other centers of culture to rubble. This intolerable loss kindled a determination among the 1001 Inventions leadership to think creatively about strategies for addressing the human crisis resulting from the war.

Nearly 30,000 students in the Azraq and Zataari camps in Jordan (the first camps to participate in 1001 Meals) go to makeshift schools. Children are offered limited education in temporary facilities with no electricity and no cellular network access. Unemployment in the camps is rampant as families are dislocated from their professions, their communities, and their livelihoods.²¹ While the camps are intended

to be temporary, their populations have grown over the past decade, and they are now a fixture in the Jordanian desert.

The team that manages the 1001 Inventions organization networks extensively with governments, global nongovernmental associations, and international organizations (such as the United Nations) in order to extend the reach of their programs. I (Hanan Dowidar) joined the 1001 Inventions team as Head of Strategic Partnerships in 2014, working to widen the 1001 Inventions network of collaborations with governments, international organizations, educational institutions, and the private sector. In this role, I support conceptualizing, planning, and implementing global educational initiatives and events, such as 1001 Meals (fig. 2).

Fig. 2. The 1001 Inventions and World Food Programme teams together with the local team of science explainers in front of exhibit elements drawn from *1001 Inventions*.



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Fig. 3. Children as they leave their school at the refugee camp after participating in a 1001 Meals event.

During the planning for 1001 Meals, the team realized that while it is difficult for people to leave the camps, which are in harsh and remote locations, it is also very challenging for outsiders to get in. Partnering with the World Food Programme, the largest humanitarian organization worldwide providing food assistance, has been essential to our ability to gain access. The result of this collaboration is a holistic program designed to provide nourishment for the bodies and minds of young students and their families.

World Food Programme Partnerships Officer Faten Al-Hindi, who has been involved in 1001 Meals since its inception, notes:

Although it's been initially challenging to secure required approvals to launch this program, it was surely worth every effort. It is not just about healthy meals and exciting learning opportunities, but also about making children feel proud about their own heritage and inspiring them to help build a better future.... This project is one of the closest to my heart. I am always thrilled as I follow the fantastic 1001 Meals team explaining scientific concepts in fun and simple way and their passion reflecting on the children's smiling faces.²²

The 1001 Meals program shares the pedagogical goals of contemporary science centers of sparking curiosity, interest, and engagement through inquiry-based and interactive learning.²³ During 1001 Meals events, existing classrooms at refugee camps are temporarily enriched with graphic panels and media equipment transforming them into immersive environments with costumed interpreters, video, and projected images.

These graphics, images, and interpreters are directly adapted from the exhibition. Using a core of explainers trained by 1001 *Inventions* educators, supported by refugees at the camps, they conduct hands-on science activities based upon available everyday materials. Again, these materials are directly adapted from materials created for the exhibition.

The first unit the team developed for the project focuses on the 11th-century Baghdadi scientist Ibn al-Haytham, who brought experimental methods to bear on the science of optics. His research, translated into Latin, became the basis for the modern understanding of how we see. Ibn al-Haytham's story is introduced to students through a short film featuring the late, legendary, Oscar-nominated actor Omar Sharif.²⁴ This film is structured to emphasize his persistence after being imprisoned for failing at several tasks (building a dam in the Nile, for example) assigned by the ruler Al-Hakim Bi-Amril-lah. The students then use everyday materials to experiment with a camera obscura, light sources, and lenses. As they end their experience, they receive themed books so they can continue their learning journey beyond the event (fig. 3). For many children, these are the very first books they own. Additional units focused on the natural sciences and medicine are currently under development.

As in the 1001 *Inventions* exhibition, interactive engagement is key; students explore refraction of light through water with a simple glass of water and straw; experiment with the images in a small camera obscura, interact with an explainer who conducts experiments with a green laser and mirror.



Fig. 4. Refugee girls engage in a science demonstration explaining the properties of light.

According to one member of the WFP team who works closely with educators, “What impresses me most are the interactive learning techniques used by the facilitators. This makes the experience much more interesting and beneficial for the children. I am also always delighted to see the teachers engaged with the activities and benefiting from the programme” (fig. 4).²⁵

In addition to curriculum based upon *1001 Inventions* content, students learn about proper nutrition and its impact on their health as they receive their healthy World Food Programme meals (intro image). The food is prepared by refugee women who work in the WFP Healthy Kitchens;²⁶ the paid work offers the women an economic opportunity that is scarce in the camps. The 1001 Meals program also recruits and trains refugees to support the delivery of education activities, providing them with jobs while honing their skills and helping inspire ambition and motivation.

The students respond particularly to learning from, and about, role models from their own regions with whom they can identify, and both the students and teachers are notably gender-balanced, which dispels stereotypes of women’s abilities in the sciences. The curriculum materials based upon *1001 Inventions* emphasize the rich intellectual and scientific history of the region and are designed to make the students more confident in their own capabilities and more hopeful for their futures in the face of a bleak present. In a program assessment conducted earlier this year in two of the Zaatari Refugee Camp schools where 1001 Meals sessions were organized, 89 percent of students surveyed agreed that they started finding that science classes could be fun. Almost all students thought of Ibn al-Haytham as a role model and reported that they would like to become scientists when they grow up to help make discoveries to benefit future generations (fig. 5). Also, 9 in 10 children agreed that they wanted to have the strength and determination to overcome challenges, just as Ibn al-Haytham did.²⁷

The activities connect children with the rich history of the Arab world. They also take them out of their daily routine and offer them a different and exciting experience.... Given that they live in a camp, this activity lightens up their day and adds to their knowledge. When the classroom gets dark and laser lights go on in preparation for the cinematic experience, it’s a magical moment for the children.²⁸

The students’ parents are involved in 1001 Meals, as they are trained and employed as facilitators, assist in logistics, and participate in the preparation and delivery of the meals.

Fig. 5. A local science explainer demonstrates light and optics concepts with the help of her colleague; having a costumed interpreter dressed as a fanciful Ibn al-Haytham builds excitement and engagement, as we discovered in *1001 Inventions*. On the walls are graphic panels adopted from the exhibition.



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Extending the reach of the program into the families encourages their ongoing support of learning while addressing the residents' widespread unemployment and lack of hope for the future.

Based upon the success of the partnerships with the World Food Programme, and the

reception of the 1001 Meals program by families in the camps, the team intends to bring the program to additional venues where possible. Gaining access to these forgotten populations not only in the Syrian refugee diaspora but in other communities has proven to be challenging but worth every effort.

Conclusion

Both *1001 Inventions* and 1001 Meals are designed to address two of the most pressing issues confronting museums. First, how do we create exhibitions and programs that are compelling and relevant, particularly to underrepresented audiences whose identities are not typically well represented? Second, how do we expand the social benefit of museums and exhibitions outside of our walls to address some of the pressing needs confronting the world?

The projects' evaluations and the widely shared enthusiasm of the audiences suggest a template to create museum programs that support critical social needs. For the *1001 Inventions* exhibition, this included centering the underrepresented in exhibition concept and content; grounding the project in thorough scholarly research (even though this can be particularly challenging for topics that have not been well represented or documented); and using effective and imaginative exhibition design. For the 1001 Meals program, this included partnering with agencies that support basic needs in underserved populations; involving the target audiences and their families in service and content delivery; and meeting one or more fundamental needs of the target audience.

The suffering caused by the global pandemic has inspired creative thinking about how museums can and must contribute to the amelioration of social crises. The 1001 Meals project in Syrian refugee camps is a model of how cultural and social programming, combined with efforts to address basic needs such as nourishing food, can provide hope for communities struggling with existential challenges. ■

1 "Home," 1001 Inventions, accessed July 24, 2021, www.1001inventions.com.

2 "What Is 1001 Meals?" 1001 Inventions, November 15, 2020. www.1001inventions.com/1001-meals-content/what-is-1001-meals/.

3 The World Food Programme is "the world's largest humanitarian organization, saving lives in emergencies and using food assistance to build a pathway to peace, stability and prosperity for people recovering from conflict, disasters and the impact of climate change." See "United Nations World Food Programme," www.wfp.org.

4 Michelle A. Mineham, "Measuring the Social Impact of Museums: Call for Study Sites," February 2, 2021, American Alliance of Museums, www.aam-us.org/2021/02/02/measuring-the-social-impact-of-museums-call-for-study-sites/.

5 "Mission and Purpose," 1001 Inventions, accessed July 24, 2021, www.1001inventions.com/about/mission/.

6 The Foundation for Science, Technology and Civilization (FSTC) is a British not-for-profit, nonpolitical, and nonreligious organization founded in 1999 by a group of philanthropic historians, scientists, engineers, and social scientists. It is dedicated to researching and popularizing the history of pre-Renaissance civilizations, especially the Muslim civilization, that have had an impact upon the scientific, technological, and cultural heritage of our modern world. For more information, see www.fstc.org.uk.

7 The exhibition and programs focus on the period roughly from the 7th century through the 17th century, often called the golden age of Muslim civilization. During this time scholars built upon, revised, and added to the knowledge of ancient civilizations – such as Greek, Ancient Egyptian, Persian, Indian, African, and Chinese. This vast body of knowledge was documented in Arabic, which served as the language of science, poetry, literature, governance and art.

8 "Activity Guides," 1001 Inventions, accessed July 24, 2021, www.1001inventions.com/funlearning/educational-materials/.

9 "Meet Scholars," 1001 Inventions, accessed July 24, 2021, www.youtube.com/playlist?list=PLnohonkwbv7KAjywsT5Ochtsw3qMnDuC6.

10 *1001 Inventions and the Library of Secrets Sir Ben Kingsley*, 1001 Inventions, accessed July 24, 2021, www.youtube.com/h?v=SxJ2OC7iXoo&list=PLnohonkwbv7LhzKw8csbZIdvGXzoZbU7x&index=1.

11 Unpublished talk at the NY Hall of Science, 2010.

12 Salim T. S. Al-Hassani, *1001 Inventions: The Enduring Legacy of Muslim Civilization* (Washington, DC: National Geographic, 2012).

13 Unpublished evaluation studies, Science Museum of London, 2010.

14 "Activity Guides," *1001 Inventions*.

15 New York's Diverse Muslim Community Listening Tour, September 15, 2011, https://nyf.org/files/2019/08/NYF_Muslim_A.pdf.

16 "The Battle over the 'Ground Zero Mosque,'" BBC News, August 3, 2010, www.bbc.com/news/world-us-canada-10846716.

17 The *New York Times* criticized the exhibition for being “less a typical science exhibition than a typical “identity” exhibition” (see Edward Rothstein, “A Golden Age in Science, Full of Light and Shadow,” December 9, 2010, www.nytimes.com/2010/12/10/arts/design/10museum.html). The review attacked the credibility and motivations of the scholarly team behind the exhibition; the team responded in detail to its claims, saying “the NYT article is wrapped in a conceptual framework which is hostile and denigrating...we, as creators of the exhibition, cannot remain silent to his attack against our credibility as historians of science and ideas.” For the complete response, see Peter Raymond, Peter Fell, Ian Fenn, “Rebuttal by the FSTC to Edward Rothstein’s Article,” January 17, 2011, <https://muslimheritage.com/rebuttal-e-rothsteins-article/>.

18 “What Is 1001 Meals?” 1001 Inventions, November 15, 2020. www.1001inventions.com/1001-meals-content/what-is-1001-meals/.

19 “United Nations World Food Programme,” www.wfp.org.

20 The Editors of Encyclopedia Britannica, “Syrian Civil War | Facts & Timeline,” *Encyclopædia Britannica* (2018).

21 “Zaatari Camp Fact Sheet,” United Nations Refugee Agency, accessed June 28, 2021, <https://reporting.unhcr.org/sites/default/files/UNHCR%20Jordan%20Zaatari%20Fact%20Sheet%20January%202021.pdf>.

22 “1001 Meals,” www.1001meals.org.

23 Ibid.

24 *1001 Inventions and the World of Ibn al Haytham*, 1001 Inventions, November 24, 2018, www.youtube.com/watch?v=MmPTTFf44k.

25 “World Food Programme Team Reflects on 1001 Meals Experiences,” 1001 Inventions, April 11, 2020, www.1001inventions.com/news/1001-meals-wfp/.

26 The World Food Programme provides and delivers healthy school meals to refugee children attending formal schools in refugee camps in Jordan via the Healthy Kitchen Project. In addition to providing nutritional information to help boost healthy eating habits, the project provides economic opportunities to Syrian women and men engaged in the sourcing, preparation, and delivery of the meals.

27 “Research Shows 1001 Meals Help Children Build Feelings of Pride and Hope,” 1001 Inventions, June 19, 2020, www.1001inventions.com/news/pride-hope/.

28 “World Food Programme Team Reflects on 1001 Meals Experiences,” www.1001inventions.com/news/1001-meals-wfp/.



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