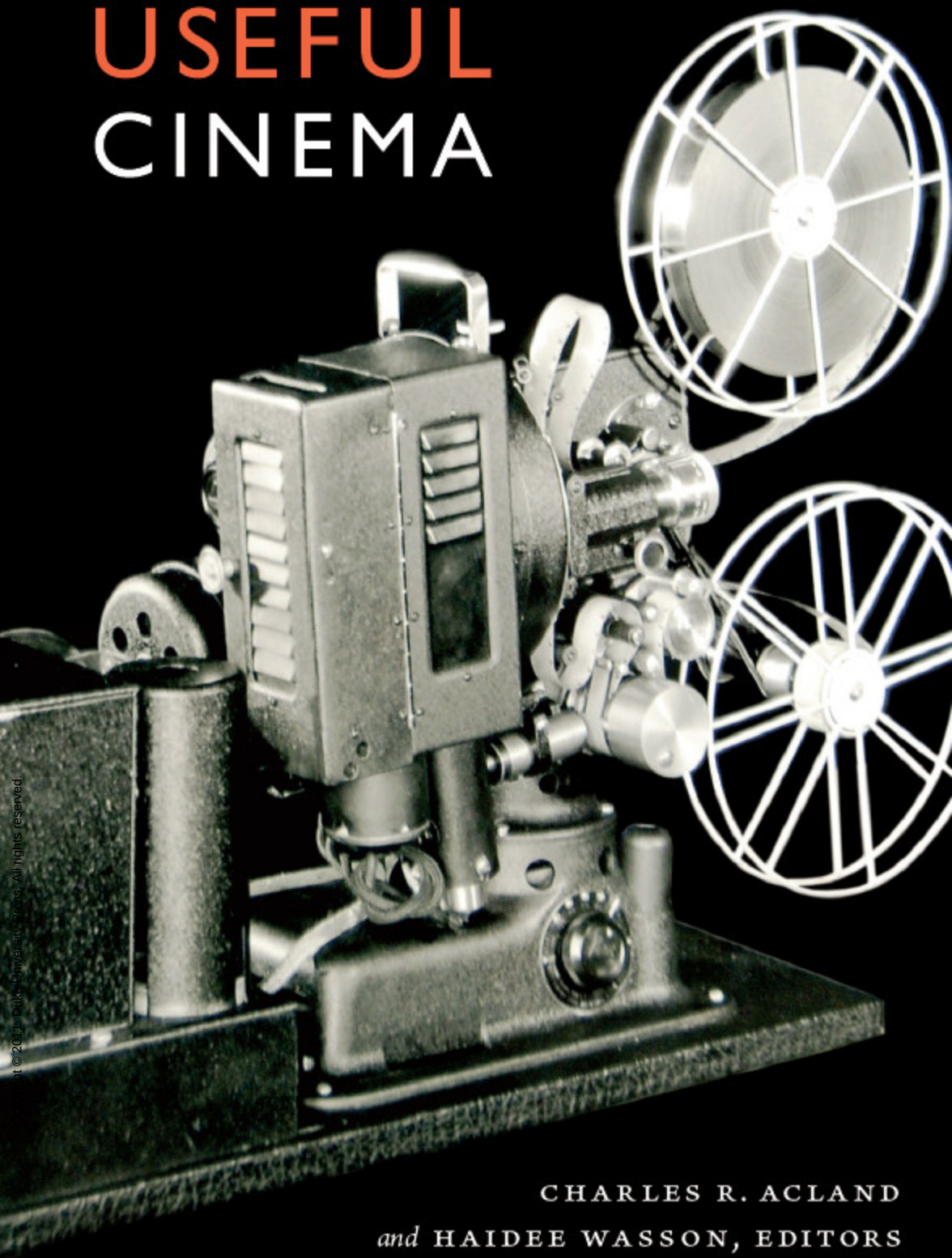
USEFUL CINEMA



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DUKE UNIVERSITY PRESS Durham & London 2011

Printed in the United States of America on acid-free paper ♾
Designed by Jennifer Hill
Typeset in Arno Pro by Tseng Information Systems, Inc.

Library of Congress Cataloging-in-Publication Data appear
on the last printed page of this book.

For Lillian Ava and Stella Lucy

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"A MOVING PICTURE OF THE HEAVENS"
THE PLANETARIUM SPACE SHOW AS USEFUL CINEMA

Alison Griffiths

Unless you are a teacher, tourist, parent of a teenager, or ex-hippy looking for a retro psychedelic experience at a Laserium show, chances are you haven't set foot in a planetarium in years.[1] The reasons are hardly obscure: catering mostly to tourists or school groups, planetarium shows are often denigrated as both expensive and kitschy. Despite their use of state-of-the-art digital effects, planetariums inevitably evoke an earlier era where visitors sat with craned necks on uncomfortable chairs fighting off sleep. However, the planetarium show remains a long-lived and highly adaptable cultural form, drawing on ideas from popular culture since its inception in the late 1910s. On the surface, the usually brief planetarium space show might seem an unlikely analog of useful cinema; however, the contemporary planetarium show contains cinema-like representational images in frequently elaborate narrative designs. Furthermore, many modern space shows, such as the "all-digital" StarRider Theater at the Adler Planetarium in Chicago where audiences are invited to "take a thrilling ride to the center of a black hole," provide the quintessential phantom

ride experience associated with both early cinema and contemporary 2-D and 3-D IMAX. But in the planetarium space show the cinematic image is also evoked in more prosaic ways, such as time-lapse video and animation. Planetarium shows are (and have always been) heavily intertextual multimedia performances deploying photographic and digital projected images and special effects drawn from popular culture, motion pictures, and apocalyptic narratives from science fiction. Indeed, the planetarium is an exemplary intermedial form for the ways in which it employs modalities lifted from theater, literature, film, radio, television, popular music, video games, and even liturgy. For the space show past and present, the notion of the screen performance as an "experience" is the semantic glue that binds these disparate amusements together.

Exactly how cinema becomes "useful" in the planetarium space show and how, historically, it has engaged with a cinematic discourse is the subject of this chapter. More specifically, my goal is to examine the planetarium as a neglected source of useful cinema, considering the emergence of the planetarium as both spatial and institutional phenomena (classic dome architecture that is a prerequisite for the performance) as well as a fascinating barometer of larger sociopolitical currents and trends in the mainstream culture of the time. Given that this chapter cannot possibly consider all the different ways in which cinema becomes "useful" in the planetarium or go into technical detail about how special effects are created and integrated into the actual show, it will nevertheless stimulate a productive debate about how we can begin to think about cinema's residual legacy in the planetarium and why, for example, cinema is considerably more useful in the planetarium today than it was at any other time in its history. Cinema's current utility in the high-tech digitized planetarium space show has certainly surpassed levels from previous moments in its history, an issue I shall address in more depth in the chapter's conclusion. In relation to the overall aims of this volume, this chapter brings an unusual—and for the most part overlooked—site of cinema to the table, to help us better understand how film can find a seat and service the twin goals of astronomy and popular culture.

The chapter examines the planetarium as useful cinema roughly chronologically, taking time at the outset to comment briefly on the planetarium's history before dealing more substantially with its phenomenological make-up, especially in relation to the overdetermined sign of the Zeiss projector, the industry standard since 1923. The subsequent sections take us from the origins of the planetarium through to the 1950s, the era we dwell on the most, since the cold war seems to offer us especially good traction on how popular astron-

omy could articulate or enunciate the hopes and anxieties of an era. We come full circle at the end of the chapter to reflect further on ways in which cinema became useful in the contemporary planetarium show.

A BRIEF HISTORY OF THE PLANETARIUM

Devices representing the movements of the planets and our moon in relation to the sun have been in use since the early days of Copernican astronomy, although the sixteenth century ushered in a number of key developments in tabletop planetarium designs, including the addition of moveable circles representing the sun, moon, and planets, and a stand showing the horizon.[2] In the orrery, "the planets of a model solar system could be made to move in circular paths around a central sun by turning a handle connected to an ingenious system of gears and spindles" as seen in the often reproduced painting by Joseph Wright in 1768 entitled *The Philosopher Reading a Lecture on the Orrery*.[3] The atmospheric candlelight on the faces of the members of the assembled lecture party, especially the two young children in the center of the painting, posits wonder as isomorphic with astronomy. The two adult male spectators cast their eyes toward the lecturer-philosopher, whose downward glance at his notes with pen in hand confirms his role as the eminent source of rational scientific knowledge. The three adolescent males and younger boy and girl in the middle ground lean forward into the device, satisfying a tactile desire to get closer to the apparatus through touching the hemispherical bars (the girl's arm around the boy underscores this). The dramatically lit faces of the center girl and boy who appear mesmerized by the orrery attract our attention the most, their wistful gazes a powerful symbol of human fascination with the cosmos. The light radiating from the apparatus makes it the terrestrial (and metaphorical) equivalent of a brightly shining sun or star glowing in the darkened room. A tension between the lecture as a serious astronomy lesson and as a magical, even supernatural event explaining astronomical forces that while scientific in nature are nevertheless evocative of metaphysical, transcendentalist ideas is powerfully inscribed in this painting. The scene is reminiscent in many respects of a séance, with the orrery substituting for the Ouija board; "presence"—suggesting both the literal sense of being "part of space within one's immediate vicinity" and the supernatural connotation of "something (as a spirit) felt or believed to be present"—is also quite palpable and a recurring theme in planetarium discourse.[4]

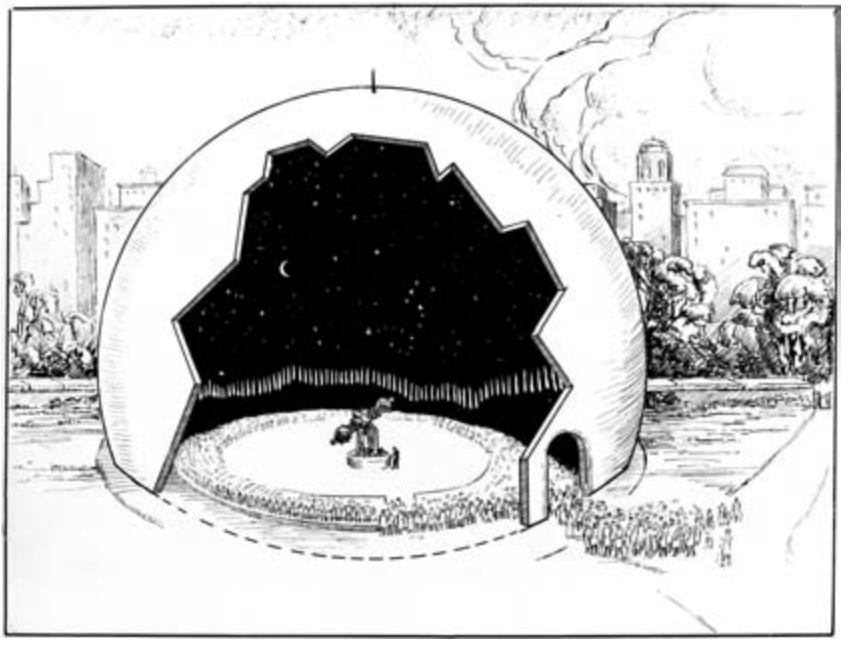
However, it was not until the seventeenth century that a device was in-

Joseph Wright, *The Philosopher Reading a Lecture on the Orrery* (1768), courtesy of the Derby Museum of Art, United Kingdom.

vented consisting of a "slowly turning sphere," in which holes were cut out for the stars and that accommodated observers on the inside of a celestial dome, as opposed to seated or standing around a tabletop apparatus. In 1654 Adam Oelschlager, a court mathematician and librarian to Duke Frederick of Holstein-Gottorp, designed a hollow globe large enough to accommodate several seated spectators: "Inside, a circular platform suspended from the axis of rotation held as many as ten people and as the globe rotated many stars and constellations drifted across the artificial sky in a way similar to that of the real sky."[5] Made of copper, the globe was eleven feet in diameter and on the inside showed gilded stars and constellation figures lit by two oil lamps. A map of the world was painted onto the outer surface, which could be examined in detail by spectators.[6] In 1660, the mathematician Erhard Weigel built a large celestial sphere on the roof of Duke Willhelm of Weimar's castle; made of iron it ended up damaging the roof and was dismantled in 1692.[7] A more sophisticated version of the "hollow sphere" type of planetarium that spectators entered was constructed between 1911 and 1913 by Wallace Atwood for the Chicago Academy of Sciences.[8] However, the prototype for today's planetarium projectors can be traced to the famous optical firm of Messrs.

Carl Zeiss of Jena, Germany, which between 1919 and 1922 worked on perfecting the technology for the opening of the Zeiss planetarium in Jena in 1924. Jointly conceived by Dr. Walther Bauersfeld and Werner Straubel of Zeiss, the projection planetarium received its first public demonstration on October 21, 1923 at the Deutsches Museum in Munich.[9] In Bauersfeld's words, the planetarium consisted of a "series of integrated projection lanterns by means of which the stars, sun, and planets are thrown upon the vaulted dome acting as a screen. The bulbous end of the instrument carry [*sic*] the slides for the fixed stars of the northern and southern firmaments respectively, while in the shank . . . the orbits of the sun, moon, and planets are arranged in tiers. Separate projectors are provided for the Milky Way, for Sirius, and for the brighter nebulae."[10] Zeiss projectors still dominate in space shows, and in 2000, the AMNH installed a Mark IX Zeiss projector for the Hayden Planetarium in the new Rose Center for Earth and Space.

Among the hurdles the Zeiss scientists had to overcome in the late 1910s and early 1920s was an opposition between the planetarium as a signifier of precision engineering and the planetarium as a device capable of unparalleled mimeticism. While we should tread with care when drawing too stark ontological comparisons between the planetarium and the motion picture, how each phenomenon was discursively constructed in the historical record as a superlative conveyor of illusion is worth briefly exploring. In contrast to the Zeiss planetarium, which German engineers initially thought was incapable of replicating the nighttime sky and astral configurations, the film projector was from its inception often referred to as nature's ally, a machine that could, in Tom Gunning's words, "serve as both tool of discovery and means of verification in a new worldview constructed on an investigation of actual entities explored through their visible aspects."[11] A "manufactured luminescence," a light that Antonia Lant argues was influenced by an Orientalist discourse, especially Egyptological referents, cinema was in no ways ontologically challenged in the task of conjuring up reality; in fact, cinema, like the sun, created light where previously there was none. Citing the early film theorist Vachel Lindsay, Lant sees valences in the metaphorical parallels he draws between cinema and the sun, a connection of especial interest to the subject of planetariums. According to Lant, Lindsay viewed film-going as akin to "sun-worshipping . . . a going to the sun" and considered cinema an instance of "our present ritual in the worship of light."[12] That Lindsey should be writing in 1924 at exactly the same time as the Zeiss planetarium opened to the public leads us to speculate on whether he was at all familiar with the experiments at Jena (trials open to



The Hayden Planetarium in an artist's rendition, looking like a giant egg from which a dinosaur has escaped. The audience lined out the door and people standing in the background present a serious challenge to the fire safety code (ca. 1935). Neg. no. 117195, courtesy of the Department of Library Services, AMNH.

the public took place in 1919) or was simply satisfying an intellectual curiosity for theories of light and projection.[13]

And yet cinema's positivism (and doppelganger, the uncanny) created a parallel universe and distinctly modernist subjectivity that while signifying reality did not pretend to represent it with the exact same perceptual coordinates as the human eye (the image, for one, is far larger than the corresponding reality, unless the vista on the screen is a distant landscape). The planetarium projector was thus charged with the engineering challenge of simulating vision into outer space, as if the roof of the dome had silently peeled back its covering to reveal the inky sky. Clyde Fisher, the director of the Hayden Planetarium, not only fell hook, line, and sinker for the illusionism when he visited Jena but was convinced that "due to some sub-conscious imagination . . . this artificial sky seems to possess the deep night blue seen in the real sky, and yet there is no blue color on the inside of the dome and none in the projection apparatus."[14]

But the Zeiss I model projector, capable of projecting forty-five hundred

stars, was also charged with the task of representing what exceeded human vision, converting astronomical theory and projection into legible, visualizable images. However, in the minds of the scientists and engineers in Jena, early versions of the planetarium were too mechanical, too cumbersome, too terrestrial even to rise to the logistical and ontological challenge of replicating stargazing. And yet, we shouldn't lose sight of the fact that while these very early blueprints of the planetarium may seem at odds with cinema in relation to how reality was represented on the screen, the planetarium quickly turned to the world of popular culture for inspiration on how to transform the celestial heavens into an entertainment medium as well as an object lesson in astronomy. The repertoire of suitable planetarium topics quickly expanded, adding narrative, music, sound, special effects, and, starting in the 1960s, lasers. But not everyone was entirely happy about the planetarium's unproblematic descent from the "Wonder of Jena" show of 1923; Ian C. McLenna, the director of the Starsenburgh Planetarium in Rochester, New York argued at the meeting of the Middle Atlantic Planetarium Society in 1967 that he often wished that "invention of the planetarium were still a future event, and the inventor an astronomer rather than an engineer." In his opinion, the planetarium's geocentrism impeded its ability to present "conceptual or descriptive astronomy unless intricate, and sometimes expensive ancillary equipment" was added.[15] We therefore see an interesting binary between the "give them what they want" model of planetarium showmanship premised upon an Aristotelian/Ptolemaic view of the universe and a more scientifically ambitious approach proposed by McLenna. Writing roughly at the same time as McLenna, Dr. Henry Charles King thought that planetariums should be purged of gimmickry: in his words, "the modern sky, whether real or artificial, is not a sky to gape at but one to think about . . . You can almost hear the mental blinkers being removed. You know that every word is 'going home.'"[16]

INTERMEDIAL CROSSINGS: SITUATING THE PLANETARIUM PHENOMENOLOGICALLY

> They see what is tantamount to a moving picture of the heavens—a picture portrayed with such realism that they feel they are sitting out of doors on the clearest night looking up at the canopy of stars overhead.—HENRY CHARLES KING, *The London Planetarium* (1958)

Like the nineteenth-century panorama, a 360-degree painting that surrounds spectators who enter and stand on a central viewing platform, the plane-

tarium experience takes place inside a dome where a virtual reality is illusionistically constructed.[17] However, unlike the panorama, spectators are seated rather than ambulatory, and the image is subject to considerable change as past, present, and future star constellations, galaxies, and universal phenomena such as black holes, asteroids, and meteors are projected onto the dome. The analogies are complex, though, with the similarities both vestigial and blatantly obvious. Each phenomenon takes place in a darkened auditorium, although the panorama is packaged less as a performance and more as a fairground-type *trompe l'oeil*, where payment guarantees entry that in most instances is not timed but is contingent on spectators finally deciding they have seen enough and leaving the viewing platform in the rotunda. The insulated dome that entombs spectators for the duration of the performance is reminiscent of the cinema auditorium, although in contrast to film, which requires spectators to look straight in front of them (or at a slight angle if they are seated on the wings), the planetarium requires an upward gaze, a look to the "celestial heavens." If in cinema the contiguity of time and space is provided by editing, in the planetarium, stars tend to dissolve from one configuration to the next rather than change suddenly, although this is by no means a hard and fast rule, since principles of editing are also to be found in planetarium shows and most of them today use motion pictures along with a range of special effects. Cinema's capacity for spatial and temporal manipulation was also realized in the planetarium, although with one difference: there were still the basic ingredients of one sun, one moon, five naked-eye planets, a Milky Way, and some three thousand stars. "Turn the planetarium sky back a thousand years more, move it forward in time a thousand years" and little would really change, hence the need, in King's words, "for additional dramatic material of a visual and mental nature."[18]

Configured something like a mathematical Venn diagram, where panoramas, planetariums, and cinema share phenomenological properties found in the overlapping circles at the center, each must nevertheless be considered on its own terms in relation to spectatorship, mimesis, the exigencies of the exhibition space, and science and popular culture. Rather than belabor the similarities and differences between the three signifying practices, it is more productive to let their points of convergence and divergence become obvious to the reader. Any effort to articulate exactly what a planetarium experience is like, especially given the range of shows on offer in planetariums across the world (from hi-tech to low-tech), may end up being as elusive as the one written by an anonymous contributor to *Vogue* in 1935, who, in struggling to

make sense of the planetarium's contradictory vectors, ended up embracing its paradoxes: "It is so far above the merely informative that it approaches the uplifting. And, ironically, it is also somewhat unearthly. It makes you feel successively, like an ancient philosopher, the weather man, and God."[19]

Notwithstanding the slipperiness of the planetarium as a signifier, a guidebook published by the United Nations Office for Outer Space Affairs in 2000 is surprisingly candid about the dos and don'ts of planetarium space shows (with some of the questions sounding a little like market research for the Playboy channel), especially the section entitled "Production Values for Planetariums," which begins with advice on the script and how to reach an audience: "What do people expect to see? How do they react to your shows now? What turns them off in a show? What turns them on in a show? It's important to know the answer to these questions." Recommending regular use of questionnaires, surveys, and even the posting of an "unmarked staff member/volunteer near the exit to gauge people's reactions," the authors aren't shy with their directives: "Listen to people as they leave. Are they animated and excited about the show? Are they shuffling out like zombies?"[20] Also on the list of recommendations are such issues as the need for accuracy, careful selection of narrator ("avoid the DJ/Voice of God/Newscaster narrator"), and music that "complements and enhances each new section or theme in the show" rather than a "'bed' of music that just lies there throughout the show." On the subject of visuals, the authors recommend including fewer of high quality over many of low quality, and varying the style such as mixing slides with video, slides with special effects, and varying the fade rates, screen locations, and use of animation and dissolve effects.[21] The chapter ends with a direct comparison to cinema: "We can't outdo movies, but we do have a unique theater which offers an experience a movie can't duplicate. Play up our strengths and minimize the weaknesses."[22]

That the UN document constructs the planetarium experience as a show requiring almost as much careful choreography as a Broadway musical should come as no surprise if we consider the historical interlacing of theater and science in the planetarium. Based on the sentiment in this document, what audiences encounter when they step inside the dome has to far exceed any old-fashioned notion of stars projected on a screen while an (obligatory) male narrator's solipsistic voice puts them to sleep.[23] This point is made clear in a chapter by J. E. Bishop in the same document in which we are told that auxiliary effects such as slides and audio aids must not only contribute to the realism but also promote an "aesthetic (peak) experience in the planetarium."[24]

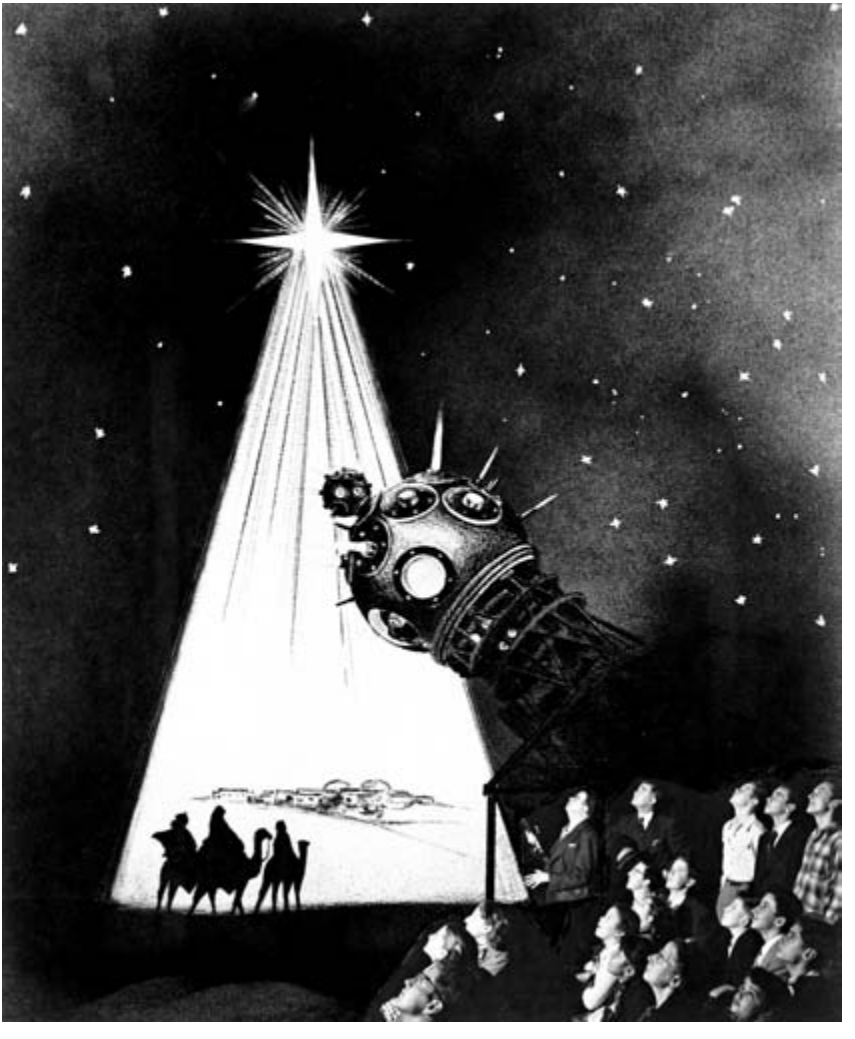
Bishop's use of the word aesthetic here can be read in the Kierkegaardian sense of grasping the immediate impact of a phenomenon, what Alistair Hannay in his introduction to Kierkegaard's *Fear and Trembling* describes as something striking you in the here and now, of its tendency to attract or repel you through a sense of immediacy, as is found in a peak experience.[25] As described by Abraham Maslow a peak experience consists of emotions of "wonder, awe, reverence, humility, surrender, and even worship before the greatness of the experience."[26] Strange as it may seem, Kierkegaard's treatise on the subject of faith in *Fear and Trembling* resonates in intriguing ways with many of the themes and goals of the planetarium space show, such as the desire for higher knowledge and the struggle to articulate about such metaphysical and abstract concepts as faith and the universe. As the planetarium historian Jordan D. Marché II put it: "As purveyors of the modern understanding of space and time, Zeiss planetaria were deemed capable of imparting to audience members a profound sense of the magnificent structure and divine purpose of our universe."[27] Indeed, two of the most important American donors — Samuel Fels (Fels Planetarium, Philadelphia) and Charles Hayden (Hayden Planetarium, New York) — "were strongly attracted by the planetarium's purported affirmation of spiritual values," especially given the rise of anti-Semitism, which Fels and Hayden felt could be somehow mitigated; in Marché's words, each man shared an "optimism that planetaria might allow human differences to seem inconsequential by comparison to the immensity of the cosmos in which all Earth's inhabitants are enjoined."[28] Cinema it seemed, or at least the idea of projected images on the planetarium dome, could be harnessed to serve this cause.

Discourses of spirituality and faith crept into the planetarium space show like a hermit crab, especially from the 1930s through to the 1950s. For example, the idea of the planetarium performance as a "drama of the heavens" (a phrase used in 1938 by the authors of a *Cartoon Guide of New York City*),[29] or the notion that "the heavens can be brought to earth," serves as a refrain in planetarium reviews and promotional materials. In 1958, the popular author Billy Arthur argued that "the unique nature of the building makes it seem a spiritual as well as a cultural heaven," a sentiment echoed the same year in a Zeiss brochure pronouncing that "an hour in a Zeiss planetarium is like an hour in a mysterious temple, where we can leave the world and its everlasting rush far behind."[30] But if one was left in any doubt as to the quasi-religious nature of the planetarium, the show's content drove home the association, with many American planetariums, not surprisingly given their marketing game plans

and desire to tap into audience interest, programming around the Christian calendar, with the Easter "Awakening" and "The Skies of Christmas Past"[31] attracting the biggest crowds.[32]

A staple of almost all planetariums in the United States in the 1950s and 1960s, the Christmas show not only underscored the non-secular proclivities of planetarium directors and curators, but also provided a golden opportunity to showcase special effects and to push the tone of the performance into the realm of the seriously kitsch, although for some spectators the religious content simply underscored the re-signification of the planetarium auditorium as a pseudo place of worship, not dissimilar to the transformation of movie theaters during the theatrical run of Mel Gibson's controversial hagio-flick *The Passion of the Christ* in the spring of 2004.[33] To quote Marché: "In the minds of several observers, planetarium lessons conveyed almost sacred experiences that placed them nearly on a level with churches or cathedrals."[34] Featuring a "very beautiful carousel . . . with all sorts of animals on it and sleighs and Christmas effects," the "Skies of Christmas Past" sounds more like a Radio City Hall extravaganza than a dignified Nativity.[35] In a poster for the "Star of Bethlehem" (ca. 1957), audience, projector, and star shore up the theatrical nature of the experience; as if appearing on a stage, the three wise men are cloaked in a spotlight while the projector protrudes into the sky like some medieval torture device. The representation of light in this image provides a fascinating meta-comment on the circulation of meaning, both secular and spiritual. Moreover, the layering of the biblical, the astronomical, and the commercial kitsch of Nativity iconography speaks volumes to the heterogeneous origins and valences of the planetarium show; the upward gaze of the spectators is an elegiac sign, affirming the neo-spiritualist undercurrent of the planetarium as a temple of worship, while the sky, star, and wise men look like they've been lifted from the cover of a Hallmark Christmas card.

Theatricality also functions as a metaphor not just for the planetarium show, but for the entire apparatus, as Armand Spitz, an American manufacturer of portable planetariums from the 1950s, argued in 1959: "'Planetarium' connotes an experience, and, in this light, must be differently planned and executed than any single facet of operation. It is more or less like 'theatre' as a general term, including every detail that goes to make the experience—theater building, stagecraft, playwriting, acting etc."[36] Waldemar Kaempffert collapsed theater with time travel, in this review of a space show at the Hayden Planetarium in 1928: "The lights are turned down gradually, just as in a theatre before the curtain rises on a play. Gradually your eyes accustom them-



Poster for "The Star of Bethlehem" at the Hayden Planetarium (ca. 1950). Neg. no. 322423, courtesy of the Department of Library Services, AMNH.

selves to the darkness. You lose all sense of confinement. In some incomprehensible optical way you have been transported into the open on a marvelously pellucid night."[37] However, while the planetarium is man-made, its chief concern is with representations that, while mediated, are *not* constructed in exactly the same way as other modes of popular culture, although in terms of iconography, the dividing line between the planetarium as astronomy and as pulpy, mass entertainment is increasingly hard to distinguish. Nevertheless,

the idea of the planetarium as a performative space is signaled not only in the debate around the need to have a lecturer present, versus a "canned" show, but in the appropriation of theatrical terms: the stars are literally the *stars* of the show, the backdrop envisioned as one gigantic theatrical setting. Writing in the *New York Times* in 1928, Walter Kaempffert referred to the planetarium as a "playhouse in which the majestic drama of the firmament is unfolded." As the performance gets under way "a hush falls over the spectators. No *play* is ever more intently followed than this in which constellations, stars, planets, sun and moon enact their parts."[38] As a way of drawing a wide audience and staving off potential boredom, the planetarium show had to steer a careful path between astronomy and spectacle, as Franz Fieseler surmised in 1932: "Far too little attention is paid to the fact that the adult visitor does not as a rule, want to be instructed and only comes to look round; he merely wants to gaze and wonder and he ought not be prevented from doing so."[39] Interlacing striking visuals and special effects into a forty-minute planetarium show was considered vital in the war against waning spectator interest (although the battle against somnambulism, as I recently discovered in the Boston Charles Hayden Planetarium, can be hard fought).

CLOSE ENCOUNTERS OF THE CELESTIAL KIND: THE DISCURSIVE EXCESS OF THE ZEISS PROJECTOR

> It is a school, theater and cinema in one, a school room under the vault of the heavens, a drama with the celestial bodies as actors.—PROFESSOR D. STROMGREN, 1928, quoted in Riesman, "The Zeiss Planetarium"

Prominent in the discourse on planetariums was a tension between expressions of wonder at the visual spectacle and the centripetal force of scientific rationalism; located literally and metaphorically at the epicenter of the performance is the Zeiss projector, an overdetermined and visually stunning icon, invested with fantasmatic meaning far exceeding the technological sum of its individual parts. The genre of science fiction writing is a ready referent in promotion stills from the Hayden Planetarium in which the dome itself becomes a spacecraft. Across time, and in a wide swath of professional and popular sources, the Zeiss projector is anthropomorphized into a cross between the Greek mythical monsters Typhon, a creature with many heads, and Argus, a monster with multiple sets of eyes. Kaempffert, for example, in 1928, called the projector a god-like machine that "makes the heavens do his bidding."[40] Gen-

dered and invested with omniscient powers, although forever at the mercy of the all-powerful projectionist, whose role in the mid-1920s, as Marché points out, was nevertheless ill defined ("whether the individual should be considered a scientist, technician, educator, or entertainer was not yet clear"), the Zeiss projector is a highly adaptive technology capable of negotiating myriad tropes from rich intertextual sites, as well as projecting powerful beams of light from its bulbous eyes.[41] Capable of (literally) reflecting and refracting both Christian and classical Greek epistemes, the projector is summarily dismissed neither as a monster nor as a technological deity but as a fusion of the two. Writing in 1928, the journalist David Riesman described what he saw as a "grotesque looking instrument like a huge dumb-bell or a caterpillar with sprawling arms," while a *New York Times* reviewer in 1984 claimed that the spectacle had been projected by nothing less than "a graceful yet grotesque machine."[42]

Overinvestment in the projector as an anthropomorphized sign extraordinaire must also be read against the backdrop of the 1930s, an era suffering from the aftershock of the stock market crash of 1929 and a depression that left global economies on their knees. Not only could the Zeiss take us out of the world of unemployment, soup kitchens, and limited prosperity, as Marché points out, it could offer an alluring prescription to a world "laced with discord, animosity, and anxiety . . . a reassurance of supernatural purpose and design in the universe, to be fostered by attendance at the mechanized demonstrations of projection planetaria."[43] For Samuel Fels in particular, the stars could serve as a parable for ills of the era, harboring "'special meaning' for those beset with the uncertainties of a depression-ridden world." According to Marché, Fels urged men and women to "draw inspiration from the celestial pageantry as they repeatedly addressed the 'problems and promises of our changing world.'"[44] Indeed, the lectures of James Stockley, an astronomer at the Fels Planetarium, reflected "many of the broader social anxieties that swirled through a depression-ridden world poised on the brink of its second global conflict," in the process blurring the lines between projection booth, soap-box, and pulpit. (According to Marché, Stockley developed some of the most provocative and controversial planetarium programs of the prewar period, even fostering a rivalry of sorts with New York's Hayden Planetarium.)[45] Here we see the planetarium assuming a quasi-civic mission in diverting people's attention away from their plight (assuming they could afford to go to a planetarium) by offering intangible benefits: as Marché puts it, "as the 1930s drifted toward another global conflict, planetaria and their asso-

ciated science museums were looked upon as emblems of American democracy, upholding and strengthening the values of free institutions and the freedom of inquiry that they embodied."[46]

TRIPS TO THE MOON AND POSTWAR AMERICA

One of the most creative ways that planetarium directors and educators leveraged public fascination in the science of astronomy while alleviating Depression-related anxiety was through the idea of space travel to the moon, which continued at least through the 1950s. The idea was not a new one, however. Georges Méliès's film of 1902, *Le voyage dans la lune*, was "not only the first science fiction film but also the first cinematic spoof of the genre," according to Elizabeth Ezra, a Méliès scholar. *Le voyage dans la lune* was also the title of a hugely popular illustrated lecture produced in New York by Garrett P. Erviss and also reproduced in Berlin in 1887.[47] In 1897, Albert A. Hopkins devoted a chapter of his *Magic: Stage Illusions and Scientific Diversions* to show how the illusion of witnessing the surface of the moon in the 1880s was created using two optical lanterns (magic lanterns) and foot, border, arc, and bunch lights.[48] The moon, as Ezra explains, had long been a "locus of narrative mystery and desire at least since the publication of Cyrano de Bergerac's *L'Autre monde* in the 17th century." (*Le voyage dans la lune* was based in part on a fantasy stage play adapted by Adolphe Dennery from Jules Verne.)[49] More recently, the Fels Planetarium began transforming the planetarium chamber into an imaginary space ship in 1936, taking its "visitors on imaginative trips to the moon, Mars, Saturn, and Jupiter."[50] Auxiliary projectors would show the landscape of these planets, and audiences would be primed for the hypothetical "Trip to the Moon" that would take place during the planetarium's centennial in the year 2033. The Fels even hired Dick Calkins, the creator of the Buck Rogers comic strip, who reportedly designed the control panel visible on the navigator's bridge.[51]

One of the most popular planetarium displays presented at the Hayden Planetarium in the summer of 1953 was described by Robert R. Coles, the chairman of the planetarium, as "a simulated trip on a rocket to the moon, in which spectators watching the planetarium's domed ceiling were *whisked* a quarter million miles through space for a landing at one of the moon's craters."[52] In the early 1950s, the Hayden Planetarium stretched the time travel analogy to its limits, when it mocked up a travel agency where children could "purchase" tickets to the moon.[53] Posters resembling package holiday ads

touted the thrills of the excursion, inviting children (and adults) to mentally assimilate the idea of virtual travel via role-play (museum staff play-acted as travel agents). Ten years later, a virtually identical description of the planetarium show appeared in *Hart's Guide to New York City*: "Here's a fascinating way to take a trip to outer space. You sit in a comfortable chair in the Sky Theater and are *whisked* anywhere in the solar system. And, most surprisingly, you can travel in the past and in the future, as well as in the present."[54] Attend the Hayden Planetarium at the AMNH today, and you'll find that "whisking" has been replaced by a rather more prosaic "flying," although the theme of virtual travel is preserved: for a price of $24 ($14 for children), visitors are "sent into space using a Digital Dome System which flies audiences through a scientifically accurate virtual re-creation of our Milky Way Galaxy and beyond, to the 'edge' of the observable universe."[55]

When Apollo 11, commanded by Neil Armstrong and Edwin "Buzz" Aldrin, touched down on the moon in 1969 (three years after the Soviet Union made travel to the moon a reality), the Hayden Planetarium was quick to exploit the public's keen interest in this landmark event. Special coverage of the Apollo 11 splashdown at the Hayden included the use of ten American Airlines air stewards (all female) who served as "hostesses . . . dressed in space-travel costumes from the popular motion picture *2001: A Space Odyssey*." The soundtrack from the now cult classic film would "provide background music during the event." After a splashdown celebration luncheon, guests left with tray replicas of the plaque deposited on the moon and containers of space food.[56] Sponsored by Western Union International, the event is early evidence of the museum's unproblematic embrace of Edward Bernays's public relations techniques blended with Hollywood-style razzmatazz. That corporations (Western Union and American Airlines) celebrated this gargantuan achievement in U.S. space exploration suggests the ease with which the planetarium negotiated the worlds of business, astronomy, public relations, and popular culture. In fact, given the boost the Apollo 11 mission gave to planetarium attendance, it would have been shortsighted of the AMNH *not* to jump on the bandwagon. The AMNH's director, Dr. Franklyn Branley, delivered a lecture in the Hayden to honor the occasion and prior to splashdown a ten-minute film about the recovery ship the USS *Hornet* was screened. Entitled *The Right People at the Right Time*, it was sponsored by Western Union.

The postwar prosperity and culture of the cold war are also key informing contexts of the 1950s and should be taken into consideration when thinking about cinema's utility within the planetarium. Given that the 1950s were, as

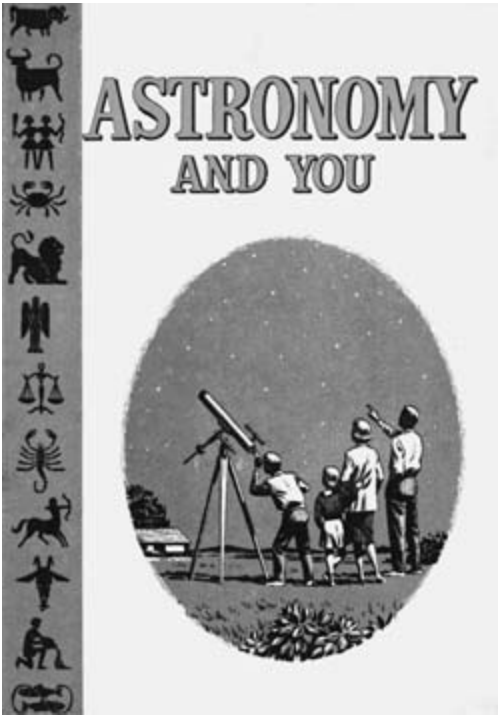
Lynn Spigel reminds us, years in which society invested "an enormous amount of capital in the ability to form a family and live out a set of highly structured gender and generational roles," it should come as no surprise that popular astronomy and the planetarium space show were instrumental in this ideological task of consensus building.[57] With the planetarium competing against new forms of recreation targeting the entire family, such as television and theme parks, there was an added incentive to invest the show with a degree of relevancy that spoke to the zeitgeist, that alleviated anxieties about the present as the planetarium lecturer had done in the Depression-era talks of the 1930s, and that would hopefully lead to repeat visits. Disneyland, which opened in Anaheim, California in 1955, capitalized fully on the postwar interest in space travel and the belief that it would soon become a reality. The "Tomorrowland" exhibit depicted "simulated views from an earth-orbiting space station and a Rocket to the Moon ride," and Disney also produced a TV program entitled "Man in Space" which was broadcast on March 9, 1955.[58] This utopian vision of interplanetary travel was undercut, in the United States at least, by the dystopic shadow of the cold war, as Thomas Doherty explains in *Cold War, Cool Medium*: "The atomic bomb and, after 1952, the hydrogen bomb augured an apocalyptic payoff to the superpower face-off. For the first time in human history, the prospect of species annihilation, not just military defeat or cities laid to waste, loomed as a decided possibility."[59] There was even an ironic twist in the prospect of nuclear Armageddon serving as a backdrop to space travel; our own society on earth might vanish at the same time as other civilizations are discovered and humans can leave their planet for the first time.

Armand N. Spitz invented the portable pinhole planetarium, which, standing at three feet high and weighing thirty-five pounds, projected roughly one thousand stars down to the fourth magnitude. According to Marché it was "equipped with an electric motor that provided diurnal rotation in four minutes," it could be turned by hand, and its metal base was adjustable for a range of northern latitudes.[60] Seeing an opportunity to enter the market, especially when Zeiss suspended manufacture with the outbreak of war in 1939, Spitz unveiled his Model A projector in 1945.[61] Spitz attempted to ease the tensions of the cold war by appropriating a spiritualist discourse to promote universal humanism; in 1959 he wrote, "A Planetarium can inspire, almost to the point of being a semi-religious experience without being narrowed by sectarianism. It can be used to develop an appreciation of the abstract, and can give the most cynical members of the audience a sense of identity with other human beings

who, like themselves, have the privilege of understanding something of the universe of which they are part."[62]

A piston in the engine of postwar prosperity and emergent consumerism, suburban living served as a backdrop for astronomy both ideologically in terms of space race propaganda and American idealism and literally as seen in an issue from the 1950s of the amateur magazine *Astronomy and You*, the front cover of which constructs astronomy as a highly social and bonding experience for both family and friends and is a useful indicator of what popular astronomy had become (and would go on to become).[63] Beneath the bright red title is an oval-shaped, matted drawing of a 1950s nuclear family standing in the yard of their house with a telescope on a tripod.[64] The bush in the foreground and the distant house in the left mid-ground are the only signs of life. Two-thirds of the image is taken up by the blue night sky full of twinkling stars. The representation of the family (with their backs to the camera) codes astronomy as a gendered pastime, with women and girls welcome additions providing they stand passively rather than actively participate. Reflecting Spigel's idea that "advice manuals and popular magazines also encouraged consumer-family lifestyles in private suburban homes,"[65] the cover shows an archetypal nuclear family, an image of the suburban family ideal, which Spigel claims was a "consensus ideology, promising practical benefits like security and stability to people who had witnessed the shocks and social dislocations of the previous two decades."[66] Looking carefully at the image, we notice that the son, who is clearly the older of the two children, is the only one actually using the telescope (the magazine, while appealing to boys, is not specifically targeting them), while his father—the "expert"—points out star constellations from behind. With their arms around one another (possibly because the temperature is cool), the mother and daughter are passive onlookers (the girl cannot even reach the eyepiece of the telescope unless the tripod legs are lowered or she is lifted up!).

Inside the planetarium dome, images of stargazers, especially children, served as calling cards for the space shows and journalistic reviews of shows. The photograph of five young schoolchildren attending a show at the Hayden Planetarium is no exception; the three children in the right-hand side of the image all crane their necks to gaze up at the ceiling, while the barely visible boy in the far left-hand side of the image has his hand up to his mouth and looks off to the right. The most enigmatic and memorable face in the photograph, however, belongs to the girl in the center who, rather than crane her



Front cover of *Astronomy and You* (ca. 1950s). Planetarium Ephemera Collection, courtesy of the Department of Library Services, AMNH.

neck upward, stares bug-eyed directly ahead with a look of bemusement on her face. Her transfixed expression is utterly captivating; staring directly ahead rather than up at the dome makes the girl a fascinating subject. While clearly enthralled at the ensuing show, she is nevertheless *not* responding in the same way as her classmates. And yet her look of wide-eyed wonder is disarmingly effective in conveying the rhapsodic nature of the experience. We might compare this image with the boy and the girl in Wright's painting *The Philosopher Reading a Lecture on the Orrery*. While also lost in thought, perhaps they long for a similarly visceral and embodied engagement with astronomy. These images of spectators' faces foreshadow the "wow effect" reaction shot that is ubiquitous in Imax film promotion, but they also tell stories of imaginations at work and somatic engagement, bodies and minds deeply affected by the sensory thrill of the planetarium space show. What is interesting about these images of spectators is that they could be looking at a movie screen, a correspondence that is perhaps the most evocative when we trace the cinematic in the planetarium show.

Rapturous wonder at the Hayden Planetarium space show (ca. 1950s). Neg. no. 2a1509, courtesy of the Department of Library Services, AMNH.

CINEMA IS/NOT THE PLANETARIUM: CONCLUDING REMARKS

> The effect is overpowering; our flesh prickles and superlatives seem inadequate.
> —"The Typical Performance and General Description of the Planetarium," in the Special Collection of the American Museum of Natural History

The cinema certainly becomes "useful" in the space show, although exactly how it has been integrated into the performance, and how its status today has been largely replaced by the digital interface of the computer video game are issues that call for more research and theorizing. Comparisons to cinema have flowed freely throughout the planetarium's history; writing in the *World's Work* in 1927, O. D. Tolischus said that "this miracle of art and science is accomplished by the utilization of the moving picture principle. For the modern planetarium is really a moving picture of the sky," although Marché (who originally used the above quote), offers a quick corrective to the comparison,

arguing that "apart from the optical projection of their images, there was little resemblance between a planetarium instrument and motion picture projector; no film of any kind was transported through the former."[67] Marché also cites Albert G. Ingalls's positive impression of the planetarium show from 1929 in which he enthused, "[it was] the best 'movie' I have ever seen." While Marché is quick to acknowledge that these journalists are speaking metaphorically, the fact that there is no engagement whatsoever with why journalists and audience members alike turned to cinema as a point of comparison is symptomatic I think of a more general reluctance to engage with how cinema becomes useful in the planetarium. Moreover, while Marché is correct that film was hardly ever projected in the planetarium dome, moving images did contribute to the overall planetarium experience and, with the invention of videotape in 1956, were projected on the domed ceiling. It is not so much cinema as projected film but the entire cinematic apparatus that is re-signified in the planetarium: discourses of virtual travel, escapism, mimesis, a temporary respite from the noise and frantic pace of the surging metropolis, and a place to achieve optimal viewing conditions that had been compromised by light pollution, fog, and haze. David Riesman, in his review of the Zeiss planetarium in 1928, lamented the unfavorable viewing conditions besetting urban dwellers: "Unfortunately, the majority of the inhabitants of our towns and cities seldom have an opportunity on account of the disturbing lights and the haze on the horizon of getting a good view of the heavens."[68] The ability to see clear skies above them was the prime reason multitudes visited the planetarium, "away from the fog and smoke of the city," in the words of Marian Lockwood, the former acting curator of the Adler Planetarium and one of the few women to achieve a directorship (in 1944).[69]

We may therefore need to rephrase the question about useful cinema and the planetarium, approaching it less as the literal inclusion of moving images in the show and more as a shared ontological desire to deliver unsurpassed illusionism. Reactions of wonderment accompanying the emergence of cinema in the 1890s that were directed as much—if not more—toward the apparatus as to the films resurface in the discourse surrounding the planetarium, when, as Marché, contends, "wonder and awe are expressed as human ingenuity in creating an exact, miniature replica of the heavens."[70] Not only does the planetarium space show provide optimal viewing conditions, but it also becomes an exemplar, an originary moment for star gazing, as King explained in 1958: "For forty minutes we sit enthralled as the age-old pageant of the skies is unfolded. In this time we see more than most of us can ever hope to see in

a lifetime."[71] But cinema and the planetarium also line up on the subject of automation, which in the case of the planetarium mitigates the need for a live lecturer. Joseph Miles Chamberlain invested the tape recorder with not inconsiderable powers when he described a scenario in 1958 in which "if the lecturer is suddenly called away by some emergency, he can flick a switch and a tape recording will take over, giving the lecture, dimming the house lights, turning on the stars, putting the planets through their proper motions in perfect synchronization with the lecture, finally bringing the daybreak and sunrise, then turning on the house lights, thanking people for listening and inviting them to come again."[72] What the automated lecture gained in institutional convenience (and budget savings) it lost, in King's view, in its capacity for mental and visual imagery since for him, the speaker, "alive and compelling, is an integral part of the experience." For King, the speaker "identifies himself with his audience and with his presentation, and his voice is more than a 'soundtrack' on a film or reel of magnetized tape."[73]

That most large science and natural history museums contain both planetariums *and* Imax screens is testimony not only to their preeminent status as lucrative funding streams (the only source of admissions-based revenue in the case of the National Museum of Natural History in Washington, which is otherwise free), but also to their longstanding success in drawing audiences who are willing to pay for a programmed, thrilling, audiovisual experience that they feel they won't be exposed to if left to their own devices. Akin in some ways to the amusement park, where there are never any free rides, the experience bought will be far and beyond what one can find unassisted. For example, displaying (fetishizing even) the planetarium dome in a glass box at the AMNH as an object of beauty and wonder performs much of the show's ideological work even before the visitors reach the "departure lounge" (a feature of the dome and the projector that has long been exploited by museums). Not only does the Hayden Planetarium in the new Rose Center for Space and Earth go to lengths to connect the planetarium to its sister galleries, but also it openly acknowledges (exploits even) its close resemblance to cinema. The FAQ section of the Hayden Planetarium advises us to "keep in mind that the environment inside the theater is similar to a movie theater, in that it is dark, and the audience is surrounded by sounds and images."[74] The planetarium has in fact become a movie theater on occasions throughout its history, as evidenced by the "Cinema in the Sky" series jointly presented by the Franklin Institute and the Philadelphia Museum of Art in 1971. One of six films sponsored by the National Film Board of Canada's "Notes on a Triangle" was projected on the

dome of the Fels Planetarium, representing what the *Franklin Institute News* called "new techniques in audiovisual communications by independent artists."[75] This is one of the few references to the planetarium dome literally becoming a movie theater; indeed, if the comments made by Ianis Arnoldovich Miezis, the curator of the Riga Planetarium, at the 5th International Planetarium Director's Conference in 1975 were in any way typical—"Under no circumstances should the visit to the Planetarium be reduced to the projection of a single film—for in this way the specific character of the equipment would be effaced"—then one can detect a proprietary claim on the planetarium experience as distinct from cinema, as a version of useful cinema with the emphasis on the *useful* rather than the *cinema*.[76]

Where then is cinema's utility in the contemporary planetarium space show? *Like* a movie but somehow different is how my pre-teen son described "Passport to the Universe" at the New York's Hayden Planetarium in 2006. Lacking the interactive dimension of the computer game that provides multiple points of entry and yet delivering on the immersive sensation that is a hallmark of both IMAX film and the graphical interface of computer games, the planetarium still needs the authority of astronomy in order to reign in these much needed but potentially contaminating popular culture influences. And yet the wonder of the Zeiss projector has been usurped by projected video, which now seems to take up much of the show. The Model IX Zeiss that uses fiber optics and forty-five integrated computers still relies upon projected video on the domed ceiling to expand the visual repertory of the program and to make shows appear more cinematic and similar in some ways to theme park dark rides that propel audiences into virtual spaces such as black holes.[77] However, as the art historian Damon Stanek observed at a show he attended in the fall of 2005, "Essentially the Hayden offered visitors big screen television, and not even high definition."[78] For fear that too much fantasy, as represented by the thrill ride connotations of the obligatory "entering a black hole" trope of high-tech planetarium space shows, might correspond too closely to Universal Studio type rides that Lauren Rabinovitz writes about,[79] the AMNH Web site and planetarium narrators point out the scientific credentials of such shows as "Passport to the Universe," which take visitors on an "exhilarating flight through a virtual recreation of our universe . . . [using] data on our solar system from NASA and the European Space Agency, and a statistical database of more than two billion stars developed by the Museum."[80]

While contemporary space shows rely increasingly on digital special effects, it would be misleading to assume that their intermedial status is by any means

new. In many ways, much has changed but even more has stayed the same in the planetarium: its phenomenological infrastructure, like the steel and concrete skin stretched over its domed roof, still depends to a large extent on virtual travel, metaphysical contemplation of the nature of the universe, discourses of nationalist supremacy that first surfaced during the years of the space race, and, most significantly, sound effects, music, and narration. Without sound, the planetarium is a mute lecturer, a visual spectacle with little to bring that spectacle to life and yet, ironically, the world it represents is completely silent.

Untangling cinema's relationship to the planetarium is by no means an easy task; that the moving image has become a standard feature of re-vamped shows such as those at the swanky new Hayden is a given, although the galaxy itself is created by a Silicon Graphics Onyx2 InfiniteReality2 visual workstation, a supercomputer that generates a 3-D map of the galaxy. However, not all planetariums are as hi-tech as the Hayden Planetarium at the Rose Center for Earth and Space; the "Countdown to Supernova" at the Charles Hayden Planetarium at the Boston Museum of Science is far less kinetic than the New York Hayden's "Passport to the Universe," containing only short sequences of time-lapse video of the sun and a black hole. Irrespective of *how* the special effects audiences witness in the planetarium dome are created, the bottom line is that for most spectators these special effects are closely related to cinema, and for those Play Stationers and X-Boxers in the audience they resonate with the visual aesthetic of the video game save the missing tactile component. Pat Frendreis of the Adler Planetarium, who arranged for the transfer of the old Mark VI Zeiss from the Hayden, is not a fan of the newer planetarium shows whose effects are mostly accomplished using video projectors: "You're looking at a video image, so the stars are greenish and soft," he says, unlike the "*real* stars of the Zeiss [Mark VI]."[81] Not surprisingly, video takes up a significant proportion of contemporary space shows and carries a great deal of the space simulation sequences such as meteors, black holes, supernovas, and the like. For example, the script for "Countdown to Supernova," created by J. Kelly Beatty for the New York Hayden in December 2004, includes a time-lapse video showing a "seething sun . . . which zooms in and fills [the] southern sky,"[82] a sequence of a planetary nebula expanding, exploding stars, and a black hole consuming matter. Whether *most* planetarium space shows are shifting the emphasis away from Zeiss-dependent performances toward more digitally enhanced, computer-generated shows would require empirically based research on the content of planetarium shows in North American and,

ideally, across the globe. Planetariums such as the Adler can satisfy the tastes of audiences accustomed to (and desirous of) more conventional shows with its traditional space show in the original dome while simultaneously drawing in newer (and presumably younger) audiences to the StarRider Theater. What we see taking place in the planetarium dome is a fascinating paradox of sorts, then; in its efforts to leverage the hyperkineticism and thrilling visuals of state-of-the-art special effects technology the planetarium space show has turned its back on the very technology that was the defining feature of the entire planetarium experience, the Zeiss projector. By abandoning the immersive simplicity of the Zeiss-created nighttime sky, the planetarium has ironically substituted an incredibly powerful simulacral effect with something that could not hold a candle to the original. Fiscally, though, it makes sense for some planetariums, which can charge visitors more for performances in both spaces or have visitors spend more money by buying discounted tickets to both shows as the Adler Planetarium does in Chicago. Cinema is not only useful in the planetarium, it would seem, but essential for its survival.

NOTES

My thanks go to Charles Acland and Haidee Wasson for their constructive feedback on an earlier version of this chapter. Parts of this work are drawn from chapter 4 of my book *Shivers Down Your Spine: Cinema, Museums, and the Immersive View* (New York: Columbia University Press, 2008), although this chapter was extensively rewritten for this anthology and incorporated new research conducted since the publication of *Shivers Down Your Spine*.

1 A co-production between the American Museum of Natural History (AMNH) and MTV2, Sonic Vision takes audiences on a "mind-warping musical roller-coaster ride through fantastical dreamspace," according to the Web site ("Sonic Vision," American Museum of Natural History, http://www.amnh.org/rose/dome/ [accessed December 28, 2009]).

2 Becklake, *The Official Planetarium Book*, 12. Copernicus's book challenged the theory of the earth's centrality in our solar system. Despite this radical discovery, Copernicus still wrongly believed that the planets moved in perfect circles (ibid.). While neither space nor the focus of this chapter permits in-depth analysis of the fascinating developments in tabletop planetariums throughout the course of the seventeenth, eighteenth, and nineteenth centuries, the gendering of globes as indispensable accessories for the proper gentleman is one of the more interesting discourses to consider. Before the mass production of globes made them a must for every late nineteenth-century schoolroom, they were considered the "necessary furnishings" of a gentleman, the perfect complement to one's library or country house.

These extremely ornate globes were useful objects to have at hand to illustrate one's travels on the "grand tour," the eighteenth-century right of passage for wealthy or merchant-class men (Middleton, "Globes of the Early 19th Century," 90). By the end of the nineteenth century, children were being targeted by toy and globe makers, who offered a wide array of globe and globe paraphernalia such as cut-out globes published on cards in magazines, inflatable balloon globes, umbrella globes, puzzle globes, building block globes, and so forth. Beginning in the 1930s, globes were the thematic inspiration of ladies' pendants and brooches (gold and silver) and even cocktail cabinets (Collins, "Educational, Ornamental, and Toy Globes," 98).

3 The painting is very often represented in the form of the famous mezzotint engraving by William Pether. The original painting can be seen in the Derby Museum and Art Gallery, United Kingdom (Collins, "Educational, Ornamental, and Toy Globes," 84).

4 Both definitions are from *Webster's New Collegiate Dictionary* (Springfield, Mass.: 1974).

5 "A Historical Survey," *The McLaughlin Planetarium*, Royal Ontario Museum, Toronto, 19. Clipping from planetarium ephemera files, Special Collections, American Museum of Natural History (hereafter abbreviated to SC-AMNH).

6 Ibid.

7 Cunningham, "The First Planetarium," 10.

8 Report by Higgins and Quadebarth for Polshek and Partners, *AMNH Planetarium and North Side Project*, Background Research Project commissioned by the AMNH, October 5, 1995, 24, SC-AMNH.

9 Marché, *Theaters of Time and Space*, 9. According to Marché, the first American-built projection planetarium was a little-known device constructed by Harvey Spencer Lewis, the imperator of the Ancient and Mystical Order of the Rosae Crucis (AMORC), in San Jose, California (ibid., 38).

10 Bauersfeld quoted in Riesman, "The Zeiss Planetarium," 238.

11 Gunning, "Phantom Images and Modern Manifestations," 42.

12 Lant, "Egypt in Early Cinema," 89–90.

13 The first planetarium program in Jena was presented unchanged for the first eight months when five hundred performances were witnessed by seventy-eight thousand people. Confident of the planetarium's ability to continue to draw audiences, David Riesman wrote in 1928 that "the program permits so many variations that there is no danger of exhausting popular interest" (Riesman, "The Zeiss Planetarium," 240).

14 Fisher, "The Hayden Planetarium," 251.

15 McLenna, "The Planetarium in Perspective," 3.

16 King, "The Planetarium and Adult Education," 38.

17 For more on the panorama, see chapter 2 of Griffiths, *Shivers Down Your Spine*; Oettermann, *The Panorama*; Hyde, *Panoramania!*; Altick, *The Shows of London*; Colligan, *Canvas Documentaries*; McDermott, *The Lost Panoramas of the Mississippi*; Miller, "The Panorama, the Cinema, and the Emergence of the Spectacular"; and Schwartz, *Spectacular Realities*, 149–76.

18 King, "The Planetarium and Adult Education," 38.
19 "Heavenly Adventures," *Vogue*, December 15, 1935, n.p.
20 Blankenbeckler, Kyro, and McColman, "Production Values for Planetariums," 97.
21 Ibid., 99–101.
22 Ibid., 102.
23 For more on gender and the staffing of American planetariums, see Marché, *Theaters of Time and Space*, 48–83. The Hayden Planetarium and the Adler Planetarium in Chicago were among the more progressive institutions in terms of their hiring policies in the 1930s, especially the Hayden, which employed the greatest number of women who published popular articles and textbooks on astronomy. The science journalist James Stokley, the first director of the Fels Planetarium, apparently refused to hire a woman lecturer. When the war effort drew some men from their roles as lecturers, women rarely broke through the glass ceiling. It would take until the adoption of Armand N. Spitz's inexpensive planetariums in the 1950s for women to gain acceptance (Marché, *Theaters of Time and Space*, 58).
24 Bishop, "The Educational Value of the Planetarium," 105.
25 Hanny, Introduction to *Fear and Trembling*, 9.
26 Maslow, *Religions, Values, and Peak Experiences*, 65.
27 Marché, *Theaters of Time and Space*, 34.
28 Ibid.
29 Hogner and Scott, "Hayden Planetarium," 31.
30 Arthur, "Please Fasten Your Seat Belt, Next Stop the Moon," 1; and "Genealogy of the Zeiss Planetarium," *The Zeiss Planetarium* brochure, 1959, SC-AMNH.
31 "The Star of Bethlehem" was one of the major crowd pullers for most planetariums; for example, in 1949 the Morehead Planetarium in Chapel Hill, North Carolina, recorded its highest attendance levels for the show, a total of 31,863.
32 In 1978, "The Star of Wonder" Christmas Show at the Hayden Planetarium was the second longest-running Christmas show in New York City after the Radio City Music Hall ("Department of Astronomy and the American Museum Hayden Planetarium," *Report of the Scientific and Education Departments*, AMNH, July 1977–June 1978, 7).
33 The film generated a great many instant books and more serious scholarly endeavors. See, for example, Beal and Linafelt, *Mel Gibson's Bible*; and Griffiths, "The Revered Gaze."
34 Marché, *Theaters of Time and Space*, 45.
35 Letter to Antoinette Gioudano from Gordon A. Atwater, October 27, 1948 in File #14 Correspondence October–December 1948 in Box 1 Guest Relations Bureau 1936–48, SC-AMNH. The first Christmas Show in Spanish was given at the Hayden Planetarium on December 16, 1970 with six hundred children in attendance. The idea was that of Tom Carey, a graduate astronomy student and intern who had served in the Peace Corps in Colombia. "Giggles, applause, and 'vivas'" were reportedly heard during the show (Meriemil Rodriguez, "Planetarium Tells the Story of la Navidad," *Daily News*, December 17, 1970, n.p. in File #2 News Clips, Box 2 News Clips 1968–84, SC-AMNH).

36 Armand N. Spitz, "Planetarium: An Analysis of Opportunities and Obligations," *The Griffith Observer*, June 1959, n.p. For a longer discussion of Spitz's business of manufactured miniature planetariums, see Spencer, "The Stars Are His Playthings," n.p.

37 Waldemar Kaempffert, "Now America Will Have a Planetarium," *New York Times Magazine*, June 23, 1928, 3.

38 Ibid., 11. Emphasis added.

39 Franz Fieseler, "A Layman's Views on Lectures in the Zeiss Planetarium," n.d., 8 pp., SC-AMNH, 3.

40 Kaempffert, "Now America Will Have a Planetarium," 11.

41 Marché, *Theaters of Time and Space*, 18.

42 Riesman, "The Zeiss Planetarium," 36; Richard F. Shepard, "Stellar Performance," *New York Times*, December 1, 1984, 13, clipping from Planetarium General Information File 1935–86, SC-AMNH.

43 Marché, *Theaters of Time and Space*, 35.

44 Samuel S. Fels, "Donation of the Planetarium to the Franklin Institute," *Journal of the Franklin Institute* 216 (July–December 1933), 791, cited in Marché, *Theaters of Time and Space*, 44.

45 Marché, *Theaters of Time and Space*, 75–76.

46 Ibid., 47.

47 Ezra, *Georges Méliès*, 120.

48 A. Hopkins, *Magic*, 348–53.

49 Ezra, *Georges Méliès*, 120.

50 Levitt, "The Planetarium," 2.

51 Marché, *Theaters of Time and Space*, 75.

52 Robert R. Coles, Untitled Document, American Museum of Natural History General Information File, 1935–1986, SC-AMNH. The Hayden has the unique distinction of being the only American planetarium to receive government/municipal funding for its construction; all the others relied on the support and backing of private businesses and foundations (Marché, *Theaters of Time and Space*, 25).

53 Joseph Kaselow, writing in the *World Journal Tribune* (February 19, 1967), quoted the National Aeronautics and Space Administration as predicting that commercial travel to the moon would not start until the year 2000 ("Selling Trips to the Moon," n.p.).

54 "Hayden Planetarium," *Hart's Guide to New York City*, 815.

55 Quote taken from "Hayden Planetarium," on the Web site for the Rose Center for Earth and Space at the American Museum of Natural History, http://www.amnh.org/rose/hayden-spacetheater.html (accessed December 28, 2009).

56 Press Release, "Special Event Coverage of Apollo Splashdown, 1969," Western Union International, New York, July 23, 1969, in General Information File 1935–86, 2, SC-AMNH.

57 Spigel, *Make Room for TV*, 2.

58 Marché, *Theaters of Time and Space*, 99–100.

59 Doherty, *Cold War, Cool Medium*, 8.

60 For more on Spitz's planetarium and his career, see Marché, *Theaters of Time and Space*, 87–115.

61 Spitz's Jr. projector, launched in 1954, was a toy planetarium that projected four hundred stars and retailed for $13.95 (Marché, *Theaters of Time and Space*, 93).

62 Spitz, "Planetarium," 81.

63 Martin J. Shannon, writing in *Wall Street Journal*, reported on the popularity of astronomy in 1967, arguing that "with imaginations fired by a decade of space achievements that make centuries of prior advances pale by comparison, businessmen, housewives, and other nonscientific types are taking up astronomy as a hobby." To support his claim Shannon referred to the doubling of subscriptions to *Sky and Telescope* in the past decade, from twenty thousand to forty thousand with 10 to 15 percent gains expected the following year (Shannon, "Gazing at the Stars: Hobby of Astronomy Lures More People," *Wall Street Journal*, October 23, 1967, n.p.).

64 We see a corollary of the social aspect of stargazing in an outdoor stargazing program developed by the Hayden Planetarium in conjunction with the New York City Department of Parks in 1969; called "Star Gazing—With or without Stars," it took place at 11:00 p.m. every other Wednesday on the Great Lawn in Central Park. In addition to an audio system and flashlight pointer that would help the lecturer address the crowd, a recommendation was also made to play soft background music to set the mood (Information in memo 4/4/68 in file 14 ["Stargazing in the Park, 1969, May–August"] in box 1, Special Events at the Planetarium, 1949–73), SC-AMNH.

65 Spigel, *Make Room for TV*, 27.

66 Ibid., 2.

67 Tolischus, "Seeing Stars," 98; and Marché, *Theaters of Time and Space*, 18.

68 Riesman, "The Zeiss Planetarium," 239. Henry Charles King, the director of the London Planetarium, addressed the issue of light pollution in his book of 1958 when he argued that in less than a minute in the planetarium we can "exchange the noise and bustle of London's busy streets for the silent beauty of the night, with a canopy of stars spread across a cloudless heaven" (King, *The London Planetarium*, 3).

69 Lockwood, "The Hayden Planetarium," 188.

70 Marché, *Theaters of Time and Space*, 71.

71 King, *The London Planetarium*, 3.

72 Chamberlain, "The Development of the Planetarium in the United States," 273. The years 1977–78 are something of a turning point with regard to the institutionalization of automation and the recorded lecture. An entry in the *Report of the Scientific and Education Departments* of the AMNH referred to the Hayden joining forces with the Morehead and the Charles Hayden Planetariums to contract with a consulting firm to study the feasibility of automation and to aid in the drawing up of a set of design and manufacturing specifications. The work would be partially funded by a conditional matching grant from the Charles Hayden Foundation ("Department of Astronomy and the American-Museum Hayden-Planetarium," *Report of the Scientific and Education Departments*, AMNH, July 1977–June 1978, 8). At the AMNH's Hayden, the live lecturer was replaced by recordings of actors such as Charlton Heston, Leonard Nimoy, and William Shatner (among others) narrating the scripts (Preston, "A Domeful of Stars").

73 King, "The Planetarium and Adult Education," 41.

74 "Frequently Asked Questions," on the Web site for the Rose Center for Earth and Space at the American Museum of Natural History, http://www.amnh.org/rose/faq.html (accessed December 28, 2009).

75 "By George! And lev and bob and oskars, Heavens!," *Franklin Institute News*, spring–summer 1971, 9. Atmospheriums, a subgenre of planetariums, are another source of useful cinema about which little has been written. The Desert Research Institute of the University of Nevada developed the idea in 1961. The daytime (as opposed to nighttime) sky is reproduced on the domed interior of the building: "special time-lapse motion picture cameras have been fitted with the new 'fish-eye' 180 degree lenses to produce fast motion films of the whole sky. The surface inch of the 5/8-inch diameter film image is enlarged approximately 400,000 times to cover the 30-ft diameter domed ceiling—the projection screen." In half an hour the audience can witness a day's worth of weather. The goal of the Atmospherium-Planetarium was to include films of all kinds of weather phenomena, including hurricanes, tornadoes, and many other dramatic weather events. For more information, see "The Fleischmann Atmospherium-Planetarium of the Desert Research Institute, University of Nevada," [untitled journal] 45, no. 7 (1964), 394–95.

76 Miezis, "Activity of the Planetarium in Riga," 62.

77 Glenn Collins, "Planetarium Introducing Updated City Star System," *New York Times*, August 11, 1999, B1.

78 Damon Stanek, "Immersion and Interactivity," paper submitted to a CUNY Graduate Center course entitled "Immersion and Interactivity in Film and the Related Arts," fall 2005, 4. My thanks to Damon for some of these references.

79 Rabinovitz, "More Than the Movies."

80 Quote from "Hayden Planetarium—Passport to the Universe," on the Web site for the Rose Center for Earth and Space at the American Museum of Natural History, http://www.amnh.org/rose/passport.html (accessed December 28, 2009).

81 Quoted in Fred Bernstein, "A Chicago Chop Shop Takes the Hayden Guts," *New Yorker*, November 4, 2001, emphasis in original.

82 "When Good Stars Go Bad" (version 3.0) / Countdown to Supernova / Original script by J. Kelly Beatty for the Charles Hayden Planetarium, 2004, SC-AMNH, 3.