Chapter 15



Bringing Cosmos to Culture

Harlow Shapley and the Uses of Cosmic Evolution

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Bringing Cosmos to Culture as Shapley's Lifelong Mission

In response to a request for an interview to be conducted at the U.S. Naval Observatory, 73-year-old famed astronomer and retired Harvard Observatory Director, Harlow Shapley (1885–1972), stated that for the upcoming NBC interview he did not "care to pose with a telescope."[1] Shapley explained that apart from some episodes in his scientific youth, he had spent little time actually peering through telescopes. He wanted to make the point that like most astronomers, his contributions were based on a range of activities distinct from the practice of observing. While this 1959 exchange is instructive with respect to Shapley's view of his astronomical work, it is also instructive with respect to Shapley's view of his potential historical legacy. Shapley believed that some of his most important contributions lay outside science; he wanted to be seen not only as a scientist, but also as a scholar and a public intellectual.[2] The title of his 1967 book, *Beyond the Observatory*, aptly characterizes a career in which considerable effort was devoted to extending his influence beyond astronomical and scientific circles.[3] Yet Shapley's work beyond these circles was shaped in important ways by his career in science, and especially, by his belief that the findings of science held lessons of profound significance for humanity. Shapley achieved scientific renown through his work as an astronomer and observatory director. In these roles he influenced the course of 20th century astronomy and shaped his contemporaries' understanding of the cosmic facts. Yet elucidating the broader and very human significance of the cosmic facts was this scientist's true calling. Bringing the cosmos to human culture was Harlow Shapley's lifelong mission.

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Shapley's mission of bringing cosmos to culture culminated in the 1950s and 1960s in an outpouring of publications and public appearances that disseminated his views widely. It was at the beginning of this period, in 1952, that he retired as Director of Harvard Observatory, a position he held for three decades. Over the course of his lengthy career, Shapley played a leadership role in the intellectual and institutional development of astronomy. With his work in administration and planning in both the prewar and postwar periods, he influenced the course of American science.[4] Entering retirement in the mid-1950s, Shapley was finally in a position to devote himself full time to the activity that had always been his passion—lecturing and writing on astronomy and sharing his insights concerning the significance of science for humanity. For nearly two decades after his retirement Shapley did just this, enthusiastically bringing cosmos to culture as a prominent popularizer and spokesman for science.

An indication of Shapley's success in spreading his cosmic perspective is perhaps best symbolized by the sense of familiarity current readers would likely experience upon reading the preface to his 1963 book, *The View From a Distant Star*:

> Mankind is made of star stuff, ruled by universal laws. The thread of cosmic evolution runs through his history, as through all phases of the universe—the microcosmos of atomic structures, molecular forms, and microscopic organisms, and the macrocosmos of higher organisms, planets, stars, and galaxies. Evolution is still proceeding in galaxies and man—to what end, we can only vaguely surmise.[5]

And surmise Shapley did. Through dozens of publications and hundreds of appearances, Shapley offered eloquent lessons on the implications of the cosmic facts. Shapley educated his readers and audiences on the latest findings of science but also inspired them with a vision of how this knowledge could positively shape the course of human history. As suggested by this excerpt, Shapley viewed cosmic evolution as a universal principle of nature, one that had relevance to human destiny.

Shapley popularized his cosmic evolutionary perspective with missionary zeal during the 1950s and 1960s. But just how successful was he in spreading his vision? To what extent did Shapley's efforts influence the development and use of the idea of cosmic evolution? Other authors in this volume provide clues and historical reflections on these intriguing questions. The

focus of this chapter is, however, on Shapley himself. The questions posed are biographical and historical. For example: How and why did Shapley come to identify cosmic evolution as the "greatest theme I know" and use it as a foundation for his vision of science and its ultimate significance for society?[6] How and why did he come to promote his evolutionary perspective as "stellar theology" and "rational religion" in the postwar decades? More generally, how are Shapley's efforts to promote his message of "Life, Hope, and Cosmic Evolution" to be understood within the broader context of a life and career that spanned the great cultural, political, and scientific transformations of the 20th century? To answer these questions we must begin with an examination of Shapley's attempts to connect cosmos and culture in the early decades of the 20th century.

Connecting Cosmos and Culture

By 1918, Shapley completed the work that established his scientific reputation and secured his standing as one of the most important contributors to 20th century astronomy. With his investigations at Mount Wilson Observatory the Princeton-trained astronomer overturned established thinking by offering a new view of the Milky Way system of stars, and especially, of Earth's place within it. His work extended the dimensions of the galaxy and presented a new picture of the arrangement of stars within it.[7] Most significantly, Shapley located the solar system at the periphery rather than at the center of the newly enlarged galaxy.[8] Shapley's work provided the foundation for what would become a standard yet compelling picture of humanity's place in the universe—Earth as a minor planet, orbiting an unremarkable star, located in an undistinguished part of a galaxy populated by countless stars.[9] This episode of scientific change and the new perspective on the universe that it revealed, became the foundation for Shapley's earliest attempts to fashion lessons of broader significance from the cosmic facts.

In a letter to astronomer George Ellery Hale, his director at Mount Wilson Observatory, Shapley emphasized the revolutionary nature of his achievement and characterized it as the latest step in a process that spanned millennia. Yet his discovery was only most recent blow to man's view of himself as the center of things; an earlier and well-known episode was the removal of Earth from the center of the cosmos by Copernicus.[10] Shapley emphasized how each step in the process of the "shifting of the center" signaled a further retreat from anthropocentrism. He identified anthropocentrism not only with the earlier attempts to understand the cosmos, but also with superstition and with tendencies inherent in most religious traditions. Anthropocentric

thinking was an obstacle to true understanding of the cosmos. Its decline thus marked the triumph of rationality.

While getting past anthropocentrism and the barrier of human ego was difficult, Shapley suggested the payoff was worth it. Vanity as a consequence of place was supplanted by a humility that encouraged a new perspective on humanity within the cosmic scheme. As he suggested in one of his many radio talks:

> We do not amount to much in size, or in duration either, for that matter; but we have the gift, I hope, of humility and reverence and we have an inborn impulse to learn and understand. We may, therefore, not be inconsequential in this scheme of stars, of gravitation, and of empty space. At any rate, we are composed of star-stuff and we are a part of a magnificent universe.[11]

With lessons of humility came lessons of cosmic connections and a new basis for reverence. Shapley integrated his lessons on the futility of anthropocentrism and the reorienting effects of the cosmic facts into his earliest efforts to popularize astronomy and science, as the newly appointed Director of Harvard Observatory, beginning in 1921.

Throughout the 1920s and 1930s, when Shapley was building an astronomy program of international stature, he was also establishing a reputation as a talented lecturer and inspiring popularizer of science. As Katherine Bryant shows in her study of Shapley as "Great Communicator" these two activities were very much connected. It was necessary for Shapley to become a self-promoter in order to obtain the resources he needed.[12] Successful publicity and outreach led to financial support for observatory and department projects, as well as his many efforts to promote science and interdisciplinary research at Harvard.[13] Yet even as Shapley linked public appearances and other popularization efforts with fundraising success, it is clear he viewed such activities as serving a higher purpose. Impulses beyond the practical and professional motivated his efforts to bring the latest findings of science to the attention of the public.

Lecturing to the public and writing for the popular press provided the means by which Shapley could express his literary and humanistic side, and a venue within which he could hone his oratorical skills.[14] These activities also presented Shapley with the opportunity to act on his belief in the importance of communicating knowledge to an intelligent and interested public. In an

exchange of letters in 1929 with the President of the American Philosophical Society, Shapley reflected longingly on the promise and possibilities of devoting oneself exclusively to such an endeavor:

> To be a subsidized and dignified and competent interpreter of current knowledge would be a noble calling—not a routine teacher, not an investigator, but a weigher, surveyor, expounder, and (perchance) a prophet![15]

While it would not be until the postwar years that Shapley would be in a position to devote himself full time to such a role, at the time he expressed these sentiments he had already made a promising start. Through his efforts to promote Harvard astronomy and science, Shapley gained increasing renown as well as growing confidence in his ability to make an impact within the broader culture. Shapley viewed himself as more than a conveyor of facts; he was someone with an important message. The message underlying Shapley's efforts to promote science was his belief in the reorienting potential of the cosmic facts, of the capacity of science to influence man's philosophies, social systems, and especially—religions.

Science as the Best Medicine for Man's Religions and Philosophies

Alternatively characterizing himself through the decades as agnostic, pagan, pantheist, and secularist, Shapley emphasized the fact that friends considered him to be a religious individual. He described himself as a "religious sort of person," typically qualifying this characterization with the statement, "by my own definition" of religion.[16] What, exactly, was this definition? Shapley's response to comments after a lecture in 1951 encapsulates the definition of religiosity that he projected throughout most of his career: "stars . . . provide me with the awe, the reverence, the poetry, the mystery, the beauty, the inspiration, the respect for and service to fellow-man that form the basis of what seems to me to be the essence of religion."[17] As documented by an interviewer in the mid-1960s, this was a perspective that Shapley traced back to an earlier time. Shapley credited his undergraduate work in astronomy at the University of Missouri with helping to awaken within him the spirituality that he would maintain throughout his life: "Some men lose interest in religion when they get into science, but it was the other way round with me."[18] As the interviewer explained, "exposure to the stars through astronomy aroused in him a feeling of awe and wonder

that he can only describe as religious." In Shapley's words: "I guess I have what John Dewey called a 'religious attitude.'"[19] This was an attitude he hoped to incite in others through his own presentations of science.

As Shapley explained at one point during his first years of public outreach at Harvard, the dual goal of his lectures was to "try to bring in both the remarkable developments in sounding the depths of space and the apparent relation of the physical universe to the spiritual outlook."[20] With lectures such as "Stars and Spiritual Things" and "The Religious Implications of Astronomy," Shapley presented a spiritually compelling vision of the cosmos, one that rarely failed to captivate and inspire audiences.[21] It is notable that it was Shapley's eloquent musings and reverential tone that earned him a reputation as an inspiring and sought-after speaker and not his actual views and sometimes irreverent pronouncements on contemporary religion. For Shapley defined his own spirituality in the context of a reverence for nature and the cosmos, not in the acceptance of traditional church doctrine nor in the belief in a personal God. Shapley believed science strengthened religion, but he did not adhere to the kind of reconciliation efforts being conducted within the popular press by prominent scientific colleagues like Robert Millikan, Michael Pupin, and his mentor Henry Norris Russell.[22] In a cultural climate in which many of his scientific colleagues were offering ways to reconcile the new findings of science with their Christian faith, it is not unexpected that Shapley's more critical and skeptical perspective on religious institutions and doctrines was conveyed to the public in cryptic ways. Typically, Shapley expressed his sentiments in terms of a support for rationality and an opposition to superstition, supernatural belief, and irrationality. For example, in his 1923 article, "The Universe and Life," Shapley suggested to his readers that the existence of life could be explained by "nothing more supernatural" than the laws of physical chemistry.[23] Despite Shapley's emphasis on superstition as the main foe of science, it is clear that he also viewed his efforts at popularizing science, in part, as a challenge to what he negatively perceived as anthropocentric, authoritarian, and static religious traditions.[24]

Throughout 1920s and 1930s, Shapley presented his brand of cosmic spirituality not as an aid to established religion, but as an alterative to traditional modes of thought.[25] From his earliest days of public outreach, Shapley conveyed the message that science could have a profound impact on other aspects of culture, especially religion. In 1923 he included himself in the company of those "who think a new social and ethical system may be founded on science."[26] Yet given the reality of the times, Shapley speculated that he believed it would not be for another generation that people would appreciate

that "religion and ethics and esthetics and political science must be grounded directly on the progress of science in an increasingly scientific age."[27] Still, the message that science could positively impact other areas of human thought was one Shapley continued to passionately promote through the coming decades. He conveyed his message during talks at schools, civic associations, churches, and in correspondence with colleagues, fans, and supporters. To one potential Harvard donor he suggested that the support of science was important because even "partial solutions" in the assault on the mysteries of the universe yielded the "most effective material for man's future meditations, religions, and philosophies."[28]

Shapley's efforts on behalf of advancing the dream of a scientifically grounded ethical, religious, and social system remained a predominately solitary enterprise in the period prior to World War II. But his ambitions for science would be energized during the war years and beyond, within an intellectual climate that encouraged interdisciplinary exploration of the problem of the relationship of science to religion, to humanistic traditions, and to questions of ethics and values. World War II had been a watershed, a true crisis of civilization. Amidst the haunting specter of nuclear annihilation, there was an urgent need to explore new ways of thinking, new orientations. Throughout his life, Shapley had given much thought to the question of new orientations. Now, through immersion in projects that encouraged dialogue between theologians, philosophers, scientists, humanists, and social theorists, he had the opportunity to bring his perspective on the reorienting potential of science to the problem of planning for a postwar world. Shapley's experiences in these years set the stage a more explicit focus on the issue of the relationship between science and religion within his own efforts to promote science.

By his own account, Shapley portrays a 1939 conversation with Rabbi Louis Finkelstein of New York's Jewish Theological Seminary as a pivotal moment in his engagement with contemporary concerns and in particular, religion.[29] He was persuaded to join with others from academia and various religious denominations in a continuing dialogue on the most pressing issues of the day—what became institutionalized as the annual Conference on Science, Philosophy, and Religion.[30] As a result of his experiences with individuals associated with the Conference as well as other groups, Shapley became convinced that religion, as well as science, had something important and necessary to contribute to the contemporary crisis. Both perspectives were needed to direct humanity toward survival and away from destruction; both perspectives could contribute to the cause of "civilization defense."[31] It

was within the context of his reevaluation of religion and his efforts to articulate a role for science in the postwar world that Shapley began to characterize science as "practical religion."[32]

Religion in an Age of Science: IRAS, Evolution, and Rational Religion

Of particular significance for Shapley's efforts to promote a wider role for science was his association throughout the 1950s with the circle of scholars, scientists, and religious leaders affiliated with the Institute for Religion in an Age of Science (IRAS). IRAS emerged from the combined efforts of individuals associated with the "Coming Great Church" conference and members of the American Academy of Arts and Sciences. The Coming Great Church conferences had been held since 1950, a movement of religious leaders geared to the creation of a new ecumenism. In response to a concern that the implications of science for this new age needed to be explored, scientists were asked to attend the 1954 conference.[33] Many of the invited scientists were members of the American Academy of Arts and Sciences; some were members of its Committee on Science and Values. IRAS was incorporated in 1954, with the following constitutional goals:

> To promote creative efforts leading to the formulation, in the light of contemporary knowledge, of effective doctrine and practices for human welfare; to formulate dynamic and positive relationships between the concepts developed by science and the goals and hopes of man expressed through religion; to state human values in such universal and valid terms that they may be understood by all men whatever their cultural background and experience, in such a way as to provide a basis for world-wide cooperation.[34]

As historian James Gilbert has noted, unlike contemporary groups with similar goals, "only in the Institute did scientists exercise the primary inspiration."[35] It is not surprising that Shapley found a home within this community, for it provided a supportive atmosphere for his own ambitions for establishing a role for science. Central to this was the leadership of Ralph Wendell Burhoe, whose vision for the establishment of a scientific theology grounded in an evolutionary conception of the cosmos informed much of the group's activities.[36]

Shapley's longstanding tendency to speak of evolution in universal terms, as well as his immersion and more general interest in biological topics,

resonated strongly with Burhoe's vision and with perspectives of the biologists and social scientists that constituted the core of IRAS.[37] Within IRAS, the question of the development of ethics and values was examined from anthropological and evolutionary perspectives and much attention was given to the question of the origin and development of religion. Religion was a topic that had long interested Shapley; for decades he had suggested that the findings of science should influence religion. In the context of his association with IRAS, Shapley began to characterize change in religion in evolutionary terms. In reflections following one meeting he wrote:

> "Religion in an Age of Science" is one of the subjects that bedevils me year after year. More than forty years of scientific research in the fields nearest to times essentially eternal and spaces approaching the infinite led me directly to contemplate the role of tender man in a tough universe. What means human life? What holds his future? On one hand we have the scientific revelations and revolutions of recent years and on the other the stubbornly held religious creeds and dogmas, mostly of long ago. I ask if they are outmoded. Am I wrong in believing that religions must evolve or die?[38]

Since his earliest musings on the significance of his own astronomical discoveries, Shapley had depicted shifts in understanding of humanity's place in the cosmos in terms of a retreat from anthropocentric thinking typical of primitive science as well as religion. He now began to characterize these shifts as grounded in the very fabric of the universe—in the existence of a cosmic principle, of an evolutionary urge toward change and growth.[39] In talks and publications Shapley reflected on this theme and posed a recurring question:

> We see that stars evolve, planetary surfaces like our own change with the flowing of time. We see that primitive plants and animals develop through the ages into complicated organisms . . . Man, too, has evolved and so have his social organizations. Why, then—this is my question—why not expect the great growth urge that runs through the universe to include the growth of man's groping philosophies?[40]

Shapley made the case for change in man's groping philosophies by drawing upon the historical evidence of change in humanity's view of his relation

to the cosmos. He cited an address by Pope Pius XII to the Vatican Academy of Sciences in 1951 as evidence that religious creeds do evolve.[41]

Shapley and Burhoe, in particular, viewed the key mission of IRAS as one of education and orientation of the public toward the next step in the evolution of religion—what they identified as "rational religion."[42] The message Shapley emphasized was that understanding and accepting the cosmic facts was part of the natural evolutionary process of the emergence of a rational religion. In the early 1950s, Shapley developed a compelling vehicle for promoting his cosmic evolutionary perspective and hopes for rational religion—the newly proposed discipline and academic course "cosmography."[43] Shapley developed this course for the general education program at Harvard and taught it during the period coinciding with his initial association with IRAS.[44] By the late 1950s, the themes of cosmography, cosmic evolution, and rational religion were seamlessly entwined in Shapley's pronouncements on the cosmic facts.

Cosmography as Practical Religion

Cosmography was defined by Shapley as "a discipline based in a cosmic way on chemistry, physics, social biology, geology, astronomy, all referred to the fundamental physical entities of space, time, matter, and energy."[45] Cosmography had wide ranging scope; it treated all the components of the cosmos and all the sciences with emphasis on connections, classification, and a common evolutionary framework.[46] The evolutionary thread underlying all operations and processes, all material and immaterial factors in the universe, was identified by Shapley as something beyond the foundational space-time and matter-energy entities. This was the "fifth entity."[47]

In earlier writings and lectures, Shapley had suggested the existence of a "fifth entity." He continued to speculate on just what this fifth entity was and on how it should be named, yet he argued definitively only with respect to its existence.[48] He now began to associate the fifth entity with cosmic evolution. Shapley's view on the significance as well as very human relevance of the idea of universal evolution was later summed up in the aptly titled "Life, Hope, and Cosmic Evolution":

> We have evidence of a truly wide Cosmic Evolution from hydrogen to *Homo*, and probably somewhere an evolution beyond the *Homo* level of sentiency. We have in Cosmic Evolution a fundamental principle of growth that affects the chemical atoms as well as plants and animals, the stars and nebulae, space-time and mass-energy. In brief, everything

> that we can name, everything material and non-material is involved. It is around this Cosmic Evolution that we might build revised philosophies and religions.[49]

For Shapley, cosmic evolution provided the basis for the kind of transformation in humanity's perspective that he had long envisioned. Since evolution was an underlying theme of cosmography, the discipline could serve as a tool for human orientation as well as inspiration for rational religion.[50]As Shapley explained: "My course in cosmography in Harvard University is aimed at orientation of man in his universe and by, inference at least, tries to explore a religion of rationality."[51] Along with papers on dinosaurs and the origin of life, students submitted papers on "Cosmography as a Practical Religion."[52]

Through the 1950s and 1960s Shapley promoted his cosmographic and evolutionary perspective across a wide range of educational, literary, and organizational venues. Through his affiliation with IRAS Shapley conducted outreach to theological schools, contributed to the journal *Zygon*, and edited the conference publication *Science Ponders Religion*.[53] As in the prewar years, Shapley found a receptive community within liberal religious circles as well as within a wide array of community and educational forums. In response to the positive feedback he received from one important talk, Shapley remarked with considerable satisfaction: "I seem to have established myself as one competent to ponder the relationships of modern scientific revelations to spiritual values and ideas."[54] Encouraged by response to his public appearances and the success of his Harvard course (and interest in it shown by several universities), Shapley took his message on the road. He toured colleges under the auspices of the National Science Foundation and the American Astronomical Society, and spent several semesters in the late 1950s as Visiting Lecturer in Cosmography. Shapley spoke of hoping to inspire a "cult of cosmography teaching" and hoping to see the field established as an academic discipline.[55]

While Shapley's plans for the institutionalization of cosmography did not work out as he had envisioned, he was nevertheless successful in disseminating his cosmographic perspective through his nationwide lecturing. Shapley confided in a number of astronomical colleagues and friends that he considered his lecturing in these years as one of his most important contributions.[56] He believed he was getting his message across; at one point he proudly reported: "They all want me back, they say, for they believe my 'rational' religion is what they want their religion to be."[57] The message that Shapley had been spreading about the cosmic facts through lecturing was also circulated

through a wide variety of publications. Throughout his career, Shapley had been a prolific writer, contributing to a wide array of general interest and popular science publications since the 1920s; he had also published a number of books in the prewar years.[58] Shapley continued to publish in a wide variety of venues through the postwar years, including *American Scholar, American Scientist, Science Digest, Scientific American*, and *Scientific Monthly*.[59] Shapley capped off his prolific publishing career with three popular books published while in his seventies: *Of Stars and Men* (1958), *The View from a Distant Star* (1963), and *Beyond the Observatory* (1967).

Of Stars and Men: Science as Stellar Theology

If Shapley can be characterized as a kind of prophet of science in a new age of science, then *Of Stars and Men: The Human Response to an Expanding Universe* can be considered as the bible of his new stellar theology.[60] Shapley was particularly proud of the many translations of this work as well as its incarnation as a film in 1964 by Oscar-winning animators John and Faith Hubley.[61] It is telling that Shapley credited the Star Island movement for providing the inspiration to complete this work, which incorporated many of the themes he had been emphasizing since his IRAS days—religion, evolution, and the significance of the cosmic facts for human destiny.[62]

Shapley characterized *Of Stars and Men* as a treatise on cosmography; its underlying theme was the reorienting potential of the cosmic facts. This book was "an essay on orientation, including a tentative obituary, one might say, of anthropocentrism in our description of the universe."[63] Shapley identified the most significant leaps in understanding of the universe over time and explained how these influenced philosophical and religious systems, necessitating "adjustments" on the part of humanity. The first and second adjustments involved acceptance of the geocentric and heliocentric views of the cosmos. The third adjustment in thinking was associated with Shapley's work—the galactocentric revolution—his identification of the center of the Milky Way galaxy and Earth's eccentric place within it. The most recent—the "Fourth Adjustment" was still in process and was biological rather than physical—it entailed the recognition that humanity was not alone in the universe.[64] Since it was a rational approach to the universe that had propelled humanity away from earlier conceptions of the cosmos, Shapley suggested that it would be the same approach that would move humanity beyond adherence to the anthropocentric religious creeds that were the remnants of the earliest civilizations. The cosmic facts would provide the foundation for the revitalization of religion. As Shapley explained:

> Some theologies are not frozen, not fossilized at a given epoch; their spokesmen recognize the bearing of the advance of knowledge on the tenability of the ancient positions. Some philosophers, not too many, re-examine, re-evaluate, and go forward. By them the cosmologies are reformed to agree with verified data of biology and physics. Moreover, this evolution of doctrine need not be reluctant, gradual, slow. In situations under human control (like man's own reasoning), beneficent mutations should be welcomed and if possible incited. For change, growth, evolution in this live dynamic universe is inherent and wide-spread. . . . Evolution affects not only stars, galaxies, and planetary crusts, animals, plants, and societies, but also touches social policies, the ethical systems of man, and the religions he fosters. May not science, broadly taken, be the fundamental cultural soil in which we plant and vitalize our religions? Need so many of them remain dated and nonrational?[65]

Acceptance of this rational approach was part of the universal thread of evolution and growth in the cosmos.[66]

While Nature supplanted God and salvation was to be sought in man's ability to reason, Shapley's cosmos was not devoid of meaning.[67] Its mystery and magnificence filled the individual with a religiously inspired awe; lessons of moral and spiritual significance could be derived from the cosmic facts. Shapley challenged his readers to "look deeply and sympathetically for religious beliefs that are founded on science, and that grow with science."[68] In his writings and lectures, Shapley offered examples of how the cosmic facts could transform one's religious and ethical perspective.

Cosmic connections is one theme that is pervasive in Shapley's works. He emphasized the idea of a fundamental physical connection between humanity and other parts of the universe through popularization of two themes—"the common breath of humanity" and "humans as star stuff." Shapley connected the past with the present by highlighting the fact that a life breath drawn today contains argon atoms breathed by our long-forgotten ancestors:

> Some of the argon atoms breathed in his first day by Adam (or any early man) are in the next breath of all of us. Some of the argon of our today's breathing will be in the first gasp of all infants a century hence. This argon traffic is obviously

> rich in suggestion; it implies a droll one-worldness and, like sunshine, recognizes no national boundaries. It links us with the breathing animals of the remote past and distant future in a sort of communal way.[69]

Shapley invoked the idea of humans as star stuff to promote the idea of a fundamental connection of life to cosmic processes. While there was a common thread in Shapley's use of the phrase "star stuff" over the course of his career—to teach a lesson about cosmic connections—the actual basis on which this was grounded did shift dramatically. Whereas in the earlier period, Shapley's vision of cosmic connections and use of star stuff was based on the belief in a uniformity of materials in stars and humans, in the later period, he used new astronomical theories (the origin of the chemical elements in the Big Bang and supernovae) as the basis for the human connection to the cosmos.[70] The lesson derived from this fundamental connection between humanity and the cosmos did not change:

> With our fellow animals and plants of land, air, and sea; with the rocks and waters of all planetary crusts, and the photons and atoms that make up the stars—with all these we are associated in an existence and evolution that inspires respect and deep reverence.[71]

In his writings, Shapley invoked the themes of the common breath of humanity and cosmic connections to suggest a cosmic basis for international brotherhood and spiritual fulfillment.[72]

Another cosmic fact that Shapley used to yield significant implications beyond science was that of extraterrestrial life. Drawing upon origin of life studies and recent developments in astronomy, Shapley claimed it was no longer possible to deny the existence of life elsewhere in the cosmos. Humanity's "Fourth Adjustment" was necessitated by "the acceptance of the evidence and the belief that the biological development on this planet is not unique and that varied and highly elaborate sentient life is abundant and widely distributed."[73] This latest adjustment had special relevance to Shapley's crusade on behalf of rationality—he used the idea of extraterrestrial life to emphasize the untenability of belief in a "one-planet deity."[74]

Shapley's efforts to depict science as a means to move beyond outdated religious traditions in these and other works was not new. What was new in the postwar period was the degree to which he explicitly and pervasively

employed religious language to present science as a kind of religion. He even invoked the phrase "stellar theology" in his 1967 *View From a Distant Star.*[75] Shapley was propelled into action by concerns shaped in the war years. Through his engagement in science-religion dialogues and debates about the future of the postwar world, he gained rhetorical strategies for articulating his cosmic evolutionary perspective and especially, for promoting it as rational religion.[76] Shapley's efforts to articulate and promote rational religion was an extension and elaboration of a perspective that he had developed over the course of a lifetime—his simultaneous advocacy of a rational approach to the universe and desire to promote a religiously inspired sensibility. His pleas for the coexistence of rationality and religion and the characterization of science as practical religion had particular resonances within the cultural climate of the postwar years. Historians have documented the increasing importance of religion in American life in the period following World War II.[77] As Stephen Whitfeld has argued in discussion of the revival of religion in American culture during the Cold War, what was revived in this period "was not so much religious belief as belief in the *value* of religion."[78] Within this culture, Shapley found audiences receptive to his vision of science and a variety of opportunities and venues within which to promote it.[79]

Astronomy, Biology, and Evolution

Shapley's promotion of cosmic evolution must also be viewed against the intellectual developments and disciplinary contexts of the biological and physical sciences. With the resurgence of Darwinian natural selection and the emergence of the Modern Synthesis, by mid-century, evolution became a unifying theme in the discipline of biology.[80]As Smocovitis highlights, Julian Huxley and other biologists emphasized the theme of cosmic evolution to help bring evolution to the forefront of biology.[81] Throughout the decades, astrophysics had been refining theories about stellar evolution and the cosmic origin of the chemical elements. Continuing progress in understanding astrophysical and cosmic processes, as well as increased scientific attention of the questions of the origin of life and the possibility of life on other worlds, contributed to a tendency on the part of many scientists to characterize evolution in universal terms. By the 1940s "cosmic, galactic, stellar, planetary, chemical, organic evolution, and cultural evolution emerged as a continuum in a 'unified' evolutionary cosmology." And by the 1950s, the wider culture "permeated with evolutionary science" and "resonated with evolutionary themes."[82]

Shapley's case illustrates that disciplinary uses of the idea of universal evolution were not limited to the biology. In his response to the increasing

attention given to biological evolution in scientific and popular arenas, Shapley was intent on making sure that astronomical evolution was given due attention. After all, as he reminded one correspondent: "Evolution is commonly taken to be a biological activity—wolf to dog, reptile to bird, monkey to man. But the evolution of atoms, molecules, stars, and galaxies is a more fundamental operation."[83] Promoting inorganic evolution was at the top of his mind in 1959—a high-profile year for evolution as a consequence of the Darwin centennial celebrations.[84] Shapley had a particularly important forum for presenting the perspective of an astronomer at the Darwin Centennial at the University of Chicago. In his contribution to this meeting, published subsequently as "On the Evidences of Inorganic Evolution," Shapley gathered together the most recent developments in physics, astronomy, and cosmology to emphasize the significance of processes of inorganic evolution.[85] Elsewhere Shapley continued to press the point that evolution needed to be viewed as a cosmic phenomenon. In the aftermath of the Chicago meeting, Shapley again shared his frustrations with a colleague:

> There has been much written in the past two years on evolution, in part celebrating the centennial of Darwin. But nearly all of the 100 articles I have seen deal with *biological* evolution. There have been new ideas on the evolution of atoms, planetary systems, stars, and galaxies. In fact, non-biological-evolution is much greater in a cosmic sense than the life developed on this peripheral planet.[86]

While Shapley was committed to insuring a wider recognition of inorganic evolution, he was also committed to promoting a wider recognition of biological evolution at the cosmic level—life in the universe. Shapley had long been interested in the problem of life—its origin and its cosmic significance. Through his work on entomology, support for biology at Harvard, and correspondence with scientists working on origin of life studies, Shapley maintained a continuing immersion in general with developments in the biological sciences.[87] Shapley's views concerning the cosmic significance of biological evolution are illustrated in an exchange with *Harper's* publisher Frederick Allen concerning a review of a book on relativity theory in the late 1940s. While Shapley admired the author's treatment of the physics, he protested the limited definition of the word universe, musing to Allen that he would like to inquire of the author "Have you heard of the biological universe?"[88] Given Shapley's interest in such questions it is not unexpected that

he was one of the more prominent public spokesman on ideas such as the origin of life or extraterrestrial life as these topics gained increasing public attention and sustained scientific inquiry. As Steven Dick outlines, changing theories of planetary and solar system formation created opportunities for scientists like Shapley to explore the question of extraterrestrial life.[89] Shapley's own contribution to the question of life in the universe included an estimate for the number of possible sites for life throughout the universe.[90] With his efforts, Shapley bolstered the case for the cosmic component of biological evolution, popularizing the idea that "we are not alone" in the universe.[91] He made the case that evolution need not be restricted to a narrow, terrestrial perspective, nor be retained as the exclusive domain of the biologist. His emphasis on inorganic evolution and on biological evolution beyond Earth supported the cosmic evolutionary perspective—of evolution as a fundamental, unifying principle in nature.

There is an even broader disciplinary context within which Shapley's promotion of universal or cosmic evolution can be viewed—this is the defense of science itself. Throughout the 20th century, the idea of a universal evolution has been used by scientists in support of the validity of biological evolution—specifically, to support the idea of human evolution in the wake of continuing challenges from fundamentalist quarters.[92] In the 1920s, Shapley used the existence of inorganic evolution as a way of arguing for the credibility of biological (and by inference, human) evolution. During the 1920s, against the backdrop of public debate and controversy over the question of the teaching of evolution, Shapley was eager to bring the weight of astronomy to bear on the issue. He characterized the "plain facts of modern astronomy" as the "best antidote of fundamentalism—much less equivocal than the arguments of biology."[93] Elsewhere Shapley characterized astronomy as presenting "the most definite evidence for evolution."[94] This strategic use of the idea of universal evolution resurfaced in the 1950s in the context of the Darwin Centennial.[95] In his contribution, Shapley stressed the important consequence of acceptance of the existence of evolution in one arena for its acceptance in another. Following his description of the Sun and stellar evolution, Shapley remarked: "therein lies the answer to those who deny, or at least question, on the grounds of mistaken theological orthodoxy, the occurrence of any kind of evolution."[96] More generally, the existence of universal evolution was used by Shapley to set modern science in opposition to the supernatural:

> We have, therefore, in the centennial of the Darwinian *biological* evolutionary theory, found that *physical* evolution

> prevails on a much greater scale. It is exhibited not only by the birth and growth of stars, galaxies, and planets, but also by the mutation of the chemical elements. An evolutionary thread seems to run through all nature, inanimate and animate. Again I point out that modern science has removed the need of appeal to miracles or the supernatural for the origin of molecules, or the origin of life, or the origin of trees, or the origin of man and his curiosity. All these evolve naturally.[97]

The Astronomer as Prophet of Science

In his study of IRAS and the contributions of Ralph Wendell Burhoe, John Durant makes the claim that in the 20th century, scientists have attempted to appropriate for their discipline "all of the authority traditionally invested in religion and the priesthood."[98] While evolutionary biology provides the context of Durant's study, his characterization is easily extended to the arena of astronomy.[99] Shapley's story aptly illustrates that in the case of astronomers as in case of biologists, evolution has also provided a compelling forum for addressing "ultimate questions of meaning and value."[100]

From the 1920s through the 1960s, Shapley devoted his energies to the mission of spreading the word of the significance of the cosmic facts for humanity.[101] His efforts were motivated on the one hand, by an interest in advancing astronomy and science, and on the other hand, by a belief in the capacity of science to influence social, ethical, and religious traditions. Nothing less than the prolongation of civilization was at stake. Through his affiliation with IRAS beginning in the 1950s, Shapley became a well-traveled and popular lecturer on "Religion in an Age of Science." Suggesting science could serve as practical religion, Shapley promoted cosmic evolution as the basis of this perspective. With his wide-ranging and influential efforts of bringing the cosmos to culture during the postwar period, Shapley certainly fulfilled his decades-old dream of serving as "a weigher, surveyor, expounder, and . . . a prophet!"[102]

Endnotes

1. Harlow Shapley to James Nelson (Manager of Program Services, NBC New York), 31 January 1959, Papers of Harlow Shapley, 1906–1966, HUG 4773.10, Box 28b, Harvard University Archives, Cambridge, Massachusetts. (hereafter Shapley papers). "Most people like to associate astronomers and telescopes inseparably. But astronomers do their chief research on

photographic plates, or with mathematics, or tables of observations. I do not care to pose with a telescope. I have designed them, and used their output, but except for a short interval years ago, I have not 'peered' through telescopes with hair on end and mouth standing open. Therefore, if we work at the Naval Observatory, it should *not* be in the heatless telescope houses, but in a library of books, or in some ordinary office."

2. For Shapley's perspective on his contributions see Shapley, *Through Rugged Ways to the Stars* (New York: Charles Scribner's Sons, 1969). This autobiography was based in part upon transcripts of interviews conducted by historians representing the American Institute of Physics.

3. Shapley, *Beyond the Observatory* (New York: Charles Scribner's Sons, 1967).

4. Owen Gingerich provides an overview of Shapley's career and diverse activities in his entry in the *Dictionary of Scientific Biography*, vol. 12 (New York: Charles Scribner's Sons, 1975), pp. 345–352. For accounts written in celebration of his Shapley's life see the special issue of *American Scholar* 40 (Summer 1971). See also the contributions by Gingerich and Michael Hoskin in *The Harlow-Shapley Symposium on Globular Cluster Systems in Galaxies*, ed. J. E. Grindlay and A. G. Davis Philip, *Proceedings of the 126th Symposium of the International Astronomical Union* (Cambridge: Cambridge University Press, 1988).

5. Shapley, *The View from a Distant Star: Man's Future in the Universe* (New York: Basic Books, 1963), p. v.

6. Shapley, *Beyond the Observatory*, p. 98.

7. Two important publications documenting Shapley's early work include "Studies Based on the Colors and Magnitudes in Stellar Clusters, Twelfth Paper: Remarks on the Arrangement in the Sidereal Universe," *Astrophysical Journal* 49 (1919): 311–336 and "On the Nature and Cause of Cepheid Variation," *Astrophysical Journal* 40 (1914): 448–465. For a perspective on Shapley's work in the context of early 20th century astronomy see Robert W. Smith, *The Expanding Universe: Astronomy's 'Great Debate,' 1900–1931* (Cambridge: Cambridge University Press, 1982). For a discussion of Shapley's important early research see Owen Gingerich and Barbara Welther, "Harlow Shapley and the Cepheids,"

Sky and Telescope 70 (December 1965): 540–542, and Bark J. Bok, "Harlow Shapley and the Discovery of the Center of Our Galaxy," in *The Heritage of Copernicus: Theories 'Pleasing to the Mind,'* ed. Jerzy Neyman (Cambridge: MIT Press, 1974), 26–61. On Shapley's later astronomical work see Owen Gingerich "Through Rugged Ways to the Galaxies," *Journal for the History of Astronomy* 21 (1900): 77–88.

8. In his autobiography Shapley described his achievement as follows: "In the scientific way, I suppose my number one contribution was locating the center of our galaxy some 33,000 or more light-years from the sun; in other words, the 'overthrow' of the heliocentric hypothesis of Copernicus. The sun-centered universe is dead and has been dead ever since the plots of the distribution of globular star clusters were developed on the basis of the pulsating theory of Cepheid variables. Several colleagues have helped in the 'overthrow,' of course." Shapley, *Through Rugged Ways to the Stars*, p. 168.

9. In 1958 Shapley's version of this image depicted Earth "as the surface of planet No. 3, in the family of a run-of-the-mill yellowish star, situated in the outer part of a typical galaxy that contains billions of typical stars." Shapley, *Of Stars and Men: The Human Response to an Expanding Universe* (Boston: Beacon Press, 1958), pp. 74–75.

10. Shapley to George Ellery Hale, 19 January 1918, Microfilm of Harlow Shapley Papers, Center for History of Physics, American Institute of Physics, College Park, Maryland.

11. Shapley, "Galaxies of Galaxies," Talk During *Collier's* Radio Hour, 21 April 1929, Shapley papers, Box 8b.

12. Katherine Bryant, "The Great Communicator: Harlow Shapley and the Media, 1920–1940" (Senior thesis, The Committee on the History of Science, Harvard University, 1992).

13. One example is Shapley's attempt to institutionalize his vision of interdisciplinary research with his plan calling for establishment of an Institute of Cosmography. "Memorandum of Interview with Dr. Rose on 26 November 1926." Rockefeller Foundation Archives, Record Group 1.1, Series 200, Box 139, Folder 1718, Rockefeller Archive

Center, Sleepy Hollow, New York. A more successful project with which he was later associated with was Harvard's Science Center. For exploration of Shapley's career in astronomy within broader intellectual and institutional contexts, see John Lankford, *American Astronomy: Community, Careers and Power, 1859–1940* (Chicago: University of Chicago Press, 1997) and Ronald E. Doel, *Solar System Astronomy in America: Communities, Patronage, and Interdisciplinary Research, 1920–1960* (Cambridge: Cambridge University Press, 1996).

14. Shapley worked as a reporter for the *Daily Sun* (Chanute, Kansas) and the *Times* (Joplin, Missouri). His journalistic goals were supplanted by astronomical ambitions during his undergraduate years at the University of Missouri.

15. Shapley to Francis X. Dercum, 6 February 1929, Harvard College Observatory—Records of Director Harlow Shapley, 1921–1956, UAV 630.22, Box 5. Harvard University Archives (hereafter Observatory records).

16. Shapley to Peter Biginelli, 22 April 1954, Shapley papers, Box 18c. For similar statements in print see Shapley, "Human Ideals and the Cosmic View," in *New Horizons in Creative Thinking*, ed. R. M. MacIver. (New York: Published for the Institute for Religion and Social Studies by Harper and Brothers, 1954), p. 8; *View From a Distant Star*, p. 180.

17. Shapley to Poff, 5 November 1951, Shapley papers, Box 22a.

18. William McCleery, "An Informal Call on Harlow Shapley at His Home in New Hampshire," *Princeton Alumni Weekly* (9 December 1964): 5.

19. Ibid.

20. Shapley to Victor Starzenski, 18 August 1923, Shapley papers, Box 8b.

21. Following one lecture Shapley received the following response from a representative of the Beefstake Club: "We went away with a sense of our infinitesimal smallness, and with a profound sense of the supreme bigness of God's universe." Stacy R. Smith to Shapley, 17 February 1925, Shapley papers, Box 8b.

22. Marcel LaFollette, *Making Science Our Own: Public Images of Science, 1910–1955.* (Chicago: University of Chicago Press, 1987), p. 154.

23. Shapley, "The Universe and Life," *Harper's Monthly Magazine* 146 (May 1923): 717. After making the point that scientists should expect the same kinds of results in the life sciences as they have obtained in the physical sciences, Shapley argues that primordial life "becomes inevitable" when "the chemical environment is right." He follows with the suggestion that "the intervention of creative gods, between the inanimate and the living, appears to the scientist to be as unnecessary for the starting of life as the opposition of unnatural devils is impotent to thwart its coming."

24. Shapley's criticism of superstition was in keeping with popular science of the period. In his study of popularization, John Burnham characterizes the existence of an "aggressive campaign against superstition" in the United States at this time. He suggests that "in the field of popularization, religion was a distraction. Superstition continued to be the real issue because it helped to define, in a negative way, what 'science stood for.'" John Burnham, *How Superstition Won and Science Lost: Popularizing Science and Health in the United States* (New Brunswick: Rutgers University Press, 1988), p. 21.

25. In his contribution to an edited volume on the philosopher Kant in 1925, Shapley wrote: "Kant realized, even better than most of us do today, that religion and science in the last analysis are the same. The science of yesterday is the revealed religion of today, and the science revealed today will be the religion of tomorrow. But the religion we are speaking of here has nothing to do with orthodoxy." Shapley, "Science," in *Immanuel Kant: 1724–1924*, ed. E. C. Wilm (New Haven: Yale University Press; London: Oxford University Press, 1925), p. 55.

26. Shapley to Arthur Hixson, 3 November 1923, Shapley papers, Box 8b.

27. Shapley to Frederick Allen, 15 October 1924, Observatory records, Box 1.

28. Shapley to E. M. Grossman, 26 March 1929, Observatory records, Box 8.

29. Shapley, "Introduction to Religion in an Age of Science," Shapley papers, Box 4a.

30. For background on the conference see Fred W. Beuttler, "Organizing an American Conscience: The Conference on Science, Philosophy and Religion, 1940–1968," Ph.D. diss, University of Chicago, 1995.

31. In a letter to a fellow astronomer in 1941 Shapley explained the cause to which he found himself devoting so much of his personal time and energy: "Although the Harvard Observatory and I personally are involved in 'national defense' activities, under both government and information auspices, my recent choice has been to devote my own personal efforts in the direction of 'civilization defense'—a high sounding phrase for the post-war problems of adjustment." Shapley to H. Plaskett, 21 October 1941, Shapley papers, Box 22a. During the war years and beyond, the task of "civilization defense" was a unifying framework for Shapley's wide-ranging activities in the public arena, which included: support for political candidates, promotion of international projects, increasing support for scientific research, encouraging interdisciplinary dialogue and educational projects, and promoting the social relevance of scientific findings. In the "Fifth Informal Memorandum from Harlow Shapley" published in August of 1941, Shapley wrote: "It is an amazing thing, this persistent urge to maintain ideals and impracticalities at this moment when we must be more realistic and practical than ever before. Research on the Structure and Behavior of the Universe is a job we intend not to drop or slacken appreciably, notwithstanding the occupation of several of us with grim realities. National Defense is immediate; Civilization Defense is a continuing and long-range business, and the solving of sidereal mysteries has always been a pioneer part of it." Rockefeller Foundation Archives, Record Group 2, Series 200, Box 210, Folder 1472, Rockefeller Archive Center, Sleepy Hollow, New York.

32. Transcript of Meeting, 3 November 1939, p. 46, Records of the Conference on Science, Philosophy and Religion, Record Group 5, Box 2, Folder 5D-2-12, Courtesy of The Joseph and Miriam Ratner Center for the Study of Conservative Judaism, Jewish Theological Seminary, New York City.

33. For the perspective of a key participant see Ralph Wendell Burhoe, "The Institute on Religion in an Age of Science: A Twenty Year View," *Zygon* 8 (March 1973): 59–80.

34. "Constitution," 9 November 1954, Shapley papers, Box 13c.

35. James Gilbert, *Redeeming Culture: American Religion in an Age of Science* (Chicago: University of Chicago Press, 1997), p. 274.

36. David R. Breed, *Yoking Science and Religion: The Life and Thought of Ralph Wendell Burhoe* (Chicago: Zygon Books, 1992). See also John Durant's analysis of Burhoe's activities in "Evolution, Ideology and World View: Darwinian Religion in the Twentieth Century," in *History, Humanity and Evolution: Essays for John C. Greene*, ed. James R. Moore (Cambridge: Cambridge University Press, 1989), pp. 355–373.

37. Participants and contributors included Alfred Emerson, Theodosius Dobzhansky, Hudson Hoagland, Kirtley Mather, and B. F. Skinner.

38. Shapley, "Statement," November 1955, Shapley papers, Box 25b.

39. Since the 1920s he had suggested connections between biological and inorganic aspects of evolution. "We are, or should be, impressed by the general scope and dignity given to the evolutionary conception by the recent studies of astronomy and physical chemistry. Evolution is not chiefly limited to the relation of man to his anthropoid forebears. That phase is one of the minor steps in the development that pervades the whole universe. . . . From our survey emerges an appreciation of the importance and magnitude of inorganic evolution." Shapley, *Starlight* (New York: George H. Doran Company, 1926), pp. 140, 142.

40. Shapley, "Life, Hope, and Cosmic Evolution," *Zygon* 1, no. 3 (1966): 277.

41. Shapley to Ralph A. Wright, 13 July 1953, Shapley papers, Box 22e. See also, Shapley, *Of Stars and Men*, p. 90 and *Beyond the Observatory*, pp. 99–100.

42. In support of the goal of promoting rational religion, Shapley suggested in early draft statements concerning the IRAS program that members' work should include "an examination of the relevance and nature of primitive religions to the construction of an effective 'religion of rationality' or 'rational religion' (Many useful studies bearing on this matter have already been made by anthropologists)." Shapley, "Afterthoughts of the

Star Island Conference 1955," Shapley papers, Box 4e. See "The Religion of Science," in James Gilbert, *Redeeming Culture: American Religion in an Age of Science* (Chicago: University of Chicago Press, 1997), pp. 273–295.

43. The official news release about the course was issued in fall of 1951. Harvard University New Office Release, 5 November 1951, Papers of Harlow Shapley, 1906–1966, HUG 4773.20, Box 1.

44. This was also the period of Shapley's retirement from the Observatory. From 1952 to 1956 he was associated with the university as Paine Professor of Astronomy.

45. Shapley to Warren Weaver, 17 February 1953, Shapley papers, Box 23a. For the course Shapley drew heavily on his own taxonomic account of "the universe of material things" published in 1930 as *Flights from Chaos: A Survey of Material Systems from Atoms to Galaxies* (New York: McGraw-Hill Book Company, 1930).

46. In a letter to David Owen of the Committee on General Education, Shapley proposed a catalog description: "A survey of the cosmos in the light of current scientific knowledge and theory is the goal of this course. The location of man and his artifacts in the world of atoms, cells, stars, and galaxies, will be examined along with the complementary inquiry of the place in the mind of man of the material universe—its appearances and realities. The age of the world, the twilight of heat, the dimensions of space, the cosmic role of the matter-energy and time-space entities will be discussed, as well as biological life as a cosmic phenomenon. The explorations will lead up and down the geological timetable, in and out of the groups and periods of the chemical elements, and along the radiation spectrum from cosmic rays to radar. The large evolutionary processes, as of the stars and rotating galaxies in an expanding universe, and the smaller evolutionary operations, as of the planets, mountains, plants, animals and societies, are a part of the dynamics of Cosmography. The only prerequisite is persistent curiosity." Shapley to Dr. David Owen, 11 January 1952, Shapley papers, Box 20b.

47. Shapley discussed this in *Beyond the Observatory*: "These observations and deductions that a drive or major process touches both animate and inanimate nature lead directly to the concept of cosmic evolution as the fifth

basic entity. But perhaps we should admit that this may be an entity that is not coordinated with the other four. Why not regard it as even more basic? Or as permeating all of them? . . . For the moment we shall accept cosmic evolution as a sort of fifth entity. . ." *Beyond the Observatory*, p. 109.

48. Shapley referred to this elusive principle in assorted ways in his writings: Something Else, Drift, Cosmic Urge, Will of God, Evolution, and Natural Logic.

49. Shapley, "Life, Hope, and Cosmic Evolution," *Zygon* 1, no. 3 (1966): 281.

50. "Cosmography, when ideally described and studied, involves an extensive and complicated content. It is too comprehensive to be handled thoroughly in brief compass. It appears to manageable, however, if used chiefly as an instrument in human orientation." Shapley, *Of Stars and Men*, p. 20.

51. Shapley to Peter Biginelli, 22 April 1954, Shapley papers, Box 18c. In the outline for the course for the 1954–1955 fall term Shapley included "the religion of rationality" as one topic to be covered in his concluding section. Shapley, "Outline of General Education course in Harvard College," Shapley papers, Box 25a. The course was taught as Natural Sciences 115.

52. "Suggested Topics," Shapley papers, Box 28d.

53. Shapley, ed., *Science Ponders Religion* (New York: Appleton-Century-Crofts, Inc., 1960).

54. Shapley to Professor Wilbur S. Hoopengardner, January 1954, Shapley papers, Box 27d. This was a talk in the fall of 1953, which Shapley gave at the Institute for Social and Religion Studies, a group affiliated with the Jewish Theological Seminary and inspired by the same circle of scholars and religious leaders involved with the Conference on Science, Philosophy and Religion.

55. Shapley to Warren Weaver, 15 January 1953, Shapley papers, Box 23a. "No college or university has started a course in Cosmography. I am disappointed." Shapley to Bernard Perry (Indiana University Press), 11 December 1956, Shapley papers, Box 26b. Encouraged by Dean Sinnott

of Yale University and others, Shapley published an account of his course. See "Cosmography: An Approach to Orientation," *American Scientist* 42 (July 1954): 471–486. Shapley to Philip H. Rhinelander, 12 February 1955, Shapley papers, Box 20b.

56. Shapley to Otto Struve, 10 December 1959, Shapley papers, Box 28d; Shapley to Bart and Priscilla Bok, 20 April 1962, Shapley papers, Box 27a.

57. "The visits were in a sense 'triumphal,' and I am sure I did a lot of commendable damage. . . . They all want me back, they say, for they believe my 'rational' religion is what they want their religion to be." Shapley to Norwood Baker, 3 December 1959, Shapley papers, Box 27a.

58. Shapley's earlier books include: *Starlight* (New York: George H. Doran Co., 1926); *Flights from Chaos: A Survey of Material Systems from Atoms to Galaxies* (New York: McGraw-Hill, 1930); and *Galaxies* (Philadelphia: Blakiston Co., 1943). The most complete list of Shapley's publications is in his NAS biographical memoir. See Bart J. Bok, "Harlow Shapley," *Biographical Memoirs of the National Academy of Sciences* 49 (1978): 241–291.

59. Shapley also contributed to numerous radio and television programs on science and astronomy. He was even a guest on Jack Paar's popular late-night talk show (with his first appearance in October 1961).

60. In his testimonial at a 1972 memorial service for Shapley close friend and IRAS associate Ralph Wendell Burhoe reflected on the impact of this book by sharing an anecdote: "I was just last week told a story by a clergyman-educator now here in Cambridge that reflects this impact. The story, I believe, is an authentic one from this clergyman's days in Princeton, when he was present at an occasion when the socialist political candidate Norm Thomson was to speak at the Unitarian church. Thomas wanted to look up a quotation in the Book of Job . . . and exclaimed 'Don't you have a Bible here? All I can find is magazines and a copy of Harlow Shapley's *Of Stars and Men!*'" Burhoe, "Contribution Written by Ralph Wendell Burhoe for the Harvard Memorial Service at Harvard University on 21 November 1972." Papers of Harlow Shapley, 1906–1966, HUG 4773.80, Box 1.

61. "The small book, "Of Stars and Men," is a sort of guide into truth, and away from orthodoxy. It has been reprinted four times in its first year and is already going into Swedish, Japanese, Spanish and Hindi; also in Pocket Books and the movies." *Harvard College Class of 1910 Fiftieth Anniversary Report* (Cambridge, MA: The Cosmos Press, 1960), p. 452. The animated film (narrated by Shapley) premiered at the Beekman Theater in New York City in April 1964. It was a critical rather than commercial success.

62. Shapley to Robert, 20 July n.d., Shapley papers, Box 23a. "To that movement I owe the inspiration to finish OSAM." IRAS annual meetings were held on Star Island, off the coast of Maine and New Hampshire.

63. Shapley, *Of Stars and Men,* p. 1.

64. "Man's Fourth Adjustment," *American Scholar* 25 (Autumn 1956): 453–457.

65. Shapley, *Of Stars and Men*, p. 90.

66. The message of the importance of a rational approach to the universe was one upon which Shapley concluded his major opus. "As rational practitioners of life and tentative interpreters of the cosmos, we deplore superstition—the last stronghold of the irrational. But, thanks to man's reasoning, never before has hampering superstition been in retreat on so wide a front . . . We no longer need appeal to anything beyond nature when we are confronted by such problems as the origin of life, or the binding forces of nucleons, or the orbits in a star cluster, or the electro-chemical dynamics of a thought, or some super-entity of the material universe. We can assail all such questions rationally." *Of Stars and Men*, p. 157.

67. In a talk presented at the 1954 IRAS summer meeting at Star Island, New Hampshire, Shapley presented what would become a familiar stance: "I should like to rationalize religion, dissolve superstition, and equate God and Nature." Shapley, "Comments on a Star Island Conference by Harlow Shapley," [1954], p. 2, Shapley papers, Box 4e.

68. Shapley, *Beyond the Observatory*, p. 105.

69. Shapley, *Of Stars and Men*, pp. 42–43. See also Shapley, "You and the Queen of Sheba: The Breathing Link," *Vogue* (15 March 1960): 108, 109, 154.

70. See "An Inquiry Concerning Other Worlds," in *Of Stars and Men*, pp. 53–75.

71. Shapley, *Of Stars and Men,* p. 149.

72. More recently, Ralph A. Alpher, the physicist who made important contributions to the development of Big Bang cosmology, presented his view on the significance of humanity's connection to the cosmos: "The stars are giant thermonuclear factories whose waste products distributed in supernovae explosions are the chemical elements. *We humans are all star stuff.* Isn't it ridiculous to think of one another as black or white or yellow or Jew or Christian or Moslem when all we really are is some primeval hydrogen chemically compounded with a bit of nuclear debris from the explosion of a star?" Ralph A. Alpher, "Theology of the Big Bang," *Religious Humanism* 17, no. 1 (Winter 1983): 8. Carl Sagan is perhaps the most well-known and influential popularizer of the image of humans as star stuff.

73. Shapley, *Of Stars and Men*, pp. 113–114.

74. "Am I not right in suggesting a new orientation—in asking for a religious philosophy that encompasses the newly known, and which is not continuously in retreat? And am I not right in asking for the abandonment of a one-planet religion and a one-planet deity?" Shapley, *Beyond the Observatory*, p. 105. See also, *Of Stars and Men,* p. 149.

75. Shapley, *View From a Distant Star*, p. 89.

76. For discussion of scientists and religious rhetoric see the work of Thomas Lessl, especially: "The Priestly Voice," *Quarterly Journal of Speech* 75 (1989): 183–197.

77. From statistics on the increase in church affiliations, to the addition of "under God" in the Pledge of Allegiance, to Billy Graham's earliest crusades, to the popularity of books and movies with spiritual themes, it

is evidence that Americans exhibited a heightened interest in religion. See Michael L. Lacey, ed., *Religion and Twentieth-Century American Intellectual Life* (Cambridge: Cambridge University Press, 1989).

78. Stephen Whitfeld, *The Culture of the Cold War*, 2nd ed. (Baltimore: The Johns Hopkins University Press, 1996), p. 86.

79. With respect to his widespread lecturing at colleges, Shapley offered this typical description of his efforts: "At 80% of the colleges and universities I visit I am asked to talk on 'Religion in the Age of Science' and my plea for rationalism appears to appeal deeply to students and faculties." Shapley to Faust, 21 December 1957, Shapley papers, Box 27c.

80. Vassiliki Betty Smocovitis, *Unifying Biology: The Evolutionary Synthesis and Evolutionary Biology* (Princeton: Princeton University Press, 1996), pp. 149–150.

81. Ibid., pp. 142–146, 152–153.

82. Ibid., pp. 165, 148, 169–171.

83. Shapley to Melba Phillips, 19 September 1959, Shapley papers, Box 28c.

84. See for example: "My remarks could be on the Geophysical Year, or Russia, but I believe it would be more to the point to talk about cosmic evolution since this is a Darwin Year," Shapley to Burhoe, 27 September 1958, Shapley papers, Box 13c.

85. Shapley, "On the Evidences of Inorganic Evolution," in *Evolution After Darwin*, ed. Sol Tax (Chicago: University of Chicago Press, 1960), pp. 23–38.

86. Shapley to James O'Connell, 28 December 1959, Shapley papers, Box 28c.

87. Through his work in entomology, support for biological projects at Harvard, and correspondence and interaction with biologists, Shapley earned a reputation within the biological community. Shapley was involved in the start of the journal *Evolution* and many of his

contemporaries recognized his special interest and contributions to biology. Smocovitis, *Unifying Biology*, p. 157. In response to Shapley's review of his paper "Life and Its Evolution," Ernst Öpik wrote to thank him for his comments, emphasizing that his remarks were given "greater weight" because he was "one of the few astronomers having biological links." Ernst Öpik to Shapley, 21 July 1952, Shapley papers, Box 21c.

88. Shapley to Frederick Allen, 12 December 1947, Shapley papers, Box 26b.

89. Steven Dick, *The Biological Universe: The Twentieth-Century Extraterrestrial Life Debate and the Limits of Science* (Cambridge: Cambridge University Press, 1996), pp. 160–221.

90. Shapley identified, as a minimum, "a hundred million planetary systems suitable for organic life." Shapley, *Of Stars and Men*, p. 74. Dick, *The Biological Universe*, pp. 428–429. Shapley presented his views at an interdisciplinary conference he organized at the American Academy of Arts and Sciences. See Shapley, "On Climate and Life," in *Climatic Change: Evidences, Causes, and Effects* (Cambridge, MA: Harvard University Press, 1953), pp. 1–12.

91. Shapley, "Life on Other Planets," *Atlantic Monthly* (November 1953): 30.

92. Biologists also used cosmic evolution in this way. Smocovitis, *Unifying Biology*, 142–143, 149–153.

93. Shapley to Maynard Shipley, 10 June 1925, Shapley papers, Box 22d. This was the year of the Scopes trial.

94. Shapley to Agnes Rowlands, 3 March 1925, Shapley papers, Box 22b.

95. Such strategic use for evolution resurfaced more recently. See, for example, an editorial in *Mercury* in which the author refers to suggested strategies offered by Eugenie Scott of the National Center for Science Education in combating increasing challenges to evolution in the classroom. Editor George Musser reminds his readers: "In classrooms across the country, teachers are skipping evolution because biblical literalists have made it too hot to handle. This is not just a battle for the biologists; it also demands the renewed attention of astronomers and astronomy

educators." Among suggestions for how his readers can act: "**Use the 'e'-word**. Evolution, in the broad sense of the development of new forms through natural processes, is a unifying concept in science. It can also be a unifying concept in science education. 'There's far less resistance to evolution in astronomy than to evolution in biology,' Scott said. Stellar evolution, galactic evolution, orbital evolution: These don't sound so threatening as self-replicating molecules and the rise of man. If people can get used to uttering 'evolution' in astronomy, Scott said, they may be less reluctant to use the word in biology." George Musser, Editorial comments, *Mercury* 25, no. 6 (November–December 1996): 2. Yet such emphasis on evolution has a flip side. The closer connection with biological evolution encouraged by astronomers' promotion of cosmic evolution has made astronomy and cosmology more visible objects for challenge. This was seen in the controversy in Kansas in where Big Bang cosmology, not just biological evolution, became the subject of legal maneuvers. For discussion of this trend see David Kaiser, "The Other Evolution Wars," *American Scientist* 95 (November–December 2007): 518–525.

96. Shapley, "On the Evidences of Inorganic Evolution," 23–24.

97. Shapley, "Stars, Ethics, and Survival," in *Science Ponders Religion*, ed. Harlow Shapley (New York: Appleton-Crofts, Inc., 1960), pp. 6–7. This was based on a talk given in December 1959 at the Fairmont Temple in Cleveland, Ohio. I have not identified any instance in publications or unpublished sources where Shapley addresses the issue of the validity of using "evolution" to characterize processes that are fundamentally very different. Like many others, he used evolution in the general sense of development or change. He also strongly suggested the existence of a fundamental connection or commonality to these different kinds of evolutionary processes.

98. John Durant, "Evolution, Ideology and World View: Darwinian Religion in the Twentieth Century," p. 369.

99. In the arena of astronomy, it has been Carl Sagan's efforts that have been the primary focus of attention. See Thomas M. Lessl, "Science and the Sacred Cosmos: The Ideological Rhetoric of Carl Sagan," *Quarterly Journal of Speech* 71 (1985): 175–187; Thomas Ross, "The Implicit Theology of Carl Sagan," *Pacific Theological Review* 18 (Spring

1985): 24–32; Smocovitis, *Unifying Biology*, p. 165; and Philip Hefner, "Editorial," *Zygon* 32 (June 1997): 145–146. As an astronomer with strong biological inclinations, one who popularized the issue of life in the universe, characterized humans as "star stuff," presented science as a kind of revealed religion, brought his message to late night talk shows, and sought cooperation with the Soviet Union as a means to preserve civilization, Shapley's story is an intriguing prelude to the subsequent activities of astronomer Carl Sagan.

100. Durant, "Evolution, Ideology and World View," p. 356. Here Durant is highlighting John C. Greene's use of this phrase. Referring to Greene's essay "From Huxley to Huxley: Transformation in the Darwinian Credo," Durant writes: "Greene deals with the continuing attempts of twentieth-century evolutionary biologists to explain the significance of their subject for human duty and human destiny, dubbing the works of these authors 'the Bridgewater Treatises of the twentieth century, in that they seek to find in science indications and proofs concerning ultimate questions of meaning and value.'"

101. Shapley's promotion of science from the 1920s through the 1960s is explored in my dissertation, upon which this study is based: "An Astronomer Beyond the Observatory: Harlow Shapley as Prophet of Science," Ph.D., University of Oklahoma, 2000. This research was supported by the History of Science Department at the University of Oklahoma and by generous grants from the American Institute of Physics and the National Science Foundation. Archival materials are reproduced with the kind permission of Harvard University Archives, the American Institute of Physics, the Jewish Theological Seminary, and the Rockefeller Archive Center.

102. Shapley to Francis X. Dercum, 6 February 1929, Observatory records. In a 1947 discussion of his extensive work on behalf of science and civilization, Shapley characterized himself as "a planner and prophet." Shapley, "Cooperation in the Atomic Age," 19 May 1947, Shapley papers, Box 1c. These were remarks prepared for the American-Russian Institute Dinner. Earlier, he characterized himself as an "embryonic evangelist in the movement for a sane age of science." Shapley to Van Dyne, 2 February 1929, Shapley papers, Box 22e. Among his many honors, Shapley was awarded a Doctor of Divinity from Meadville Theological Seminary (Chicago, 1969).