

CHAPTER ELEVEN

EXTRATERRESTRIAL LIFE FOR THE MASSES: KNUT LUNDMARK AND THE BOUNDARIES OF SCIENCE

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Introduction

While astrobiology today is an established part of modern science – there are academic journals, conferences, an IAU commission, PhD programmes devoted to astrobiology – that has not always been the case. The search for extraterrestrial life has at times been defined as extraneous to science: something that did not really belong inside the scientific enterprise. There have been attempts to wall it off from science proper when, at various stages in the history of astrobiology, observatory directors have turned down proposals for radio telescope time, politicians have argued that it was a waste of taxpayers' money, and distinguished biologists have said that it was “a science without a subject” threatening to siphon off funding from more established parts of biology. It has been – to quote a leading historian of the field – an activity “at the limits of science” (Dick 1996); and sometimes that limit has been drawn in such a way that it was excluded from science. However, the scientific search for and discussion of extraterrestrial life – variously labelled astrobiology, exobiology or bioastronomy – *has* managed to develop and become a part of science. How this came about exemplifies how an ensemble of processes, powers, and people together can shape the boundaries of science (Gieryn 1999).

To succeed, proponents of the scientific search for life on other planets have drawn on a variety of resources. They have been successful in getting funding from agencies such as NASA, which was important at a time when the pioneers of astrobiology had trouble securing funding from agencies aimed at more established disciplines. Astrobiology-oriented astronomers made vital contributions to topics that were seen to be of high societal relevance, such as the nuclear winter debate and the growing

awareness of climate change – proving that the field was not only *l'art pour l'art* pure science pursued for philosophical reasons, but could produce research results with an impact outside of the field. Prominent and well-established scientists – some of them Nobel Prize winners – gave credibility to the field, leveraging their status behind a bid for exobiology and bioastronomy belonging inside the boundary demarcating science from nonscience (Badash 2009; Strick 2004). Another resource – policy-wise but sometimes also economically, used to occasional great effect by the astrobiologists – came out of very successful public engagement with science-related activities pursued in a range of contexts: astrobiology has had no trouble making people outside *academe* or the traditional channels of research policy interested in the field. Organizations such as The Planetary Society, wealthy individuals such as Microsoft co-founder Paul Allen and filmmaker Steven Spielberg, and millions of participants in the pioneering citizen-science project Seti@home: all have been supporters in one way or another of exobiology, an interest fuelled by popular science in the media. The relationship between science and public can have an impact on the workings of science. To gain an understanding of the conditions shaping the scientific search for life in the universe, one ought not to look exclusively on the workings of academic peer review – neither on technological developments that have given new tools for the astrobiologist, traditional funding mechanisms, research policy priority-setting processes, or the dynamics of academic organisation. The field has had a number of prominent spokespersons; their appearances in a variety of media have had an effect on the science of exobiology.

The popularization of exobiology has a long history. Studies of the dynamics of the discipline during its formation need to take into account this perspective of public engagement with science. They can take their cue from recent work in history of science studying publishing, media, and popularization as important parts of scientific practice: specifically, a growing body of historical work that identifies publishers, printers, booksellers, television producers, etc. as significant actors and factors in charting the historical development of science. In this approach to history of science, communication is not something that merely follows once knowledge has been produced; it is conceptualised as an integral part of scientific practice (Secord 2004; Secord 2000; Topham 2004; Topham 2009).

Astrobiology news and popularization feature regularly in today's popular science; but, as said, they come with a history: scientists working on extraterrestrial life have routinely published their findings in public outlets. One could argue that, before the discipline began to form – before

the arrival of today's academic journals, conferences, graduate schools, and funding programmes for astrobiology – such popular publications functioned as the primary platforms for the development of ideas, concepts, and theories on the scientific search for life in the universe, there being so few professional and academic communication channels available.

This chapter is about the search for extraterrestrial life during its pre-disciplinary era: particularly the 1920s and 1930s. It will focus on Swedish astronomer Knut Lundmark's (1889–1958) work on extraterrestrial life, including the ways he used non-academic publications to popularize and develop his ideas. Lundmark's defence of the panspermia hypothesis – against the criticism levelled by Paul Becquerel – came in what would normally be termed a popular publication, not in an academic journal. I analyse the contents of Lundmark's publications and their reception among professional astronomers. I draw on unpublished sources, such as letters between Lundmark and his publishers preserved in the Knut Lundmark Collection at the Lund University library.

Knut Lundmark

In the spring of 1925, Knut Lundmark received a proposal from Uppsala publisher J.A. Lindblad: would he be interested in writing a popular work for entering in a prize competition? He *was* interested. The editor at Lindblad's proposed the title "The Depths of Space"; Lundmark's counter-proposal, in mid-August, was *Världsrymdens liv*: "Life in the Universe".

The editor was sceptical at first: the subject lacked concrete focus, as he wrote in his letter to Lundmark at Greenwich Observatory, where Lundmark was a guest researcher. Lundmark dashed off a quick response but succeeded in persuading the editor, who by the end of August was in agreement. Lundmark delivered the manuscript in December of the same year; in January, he was awarded one of four prizes in the competition – the other three were for books on the nature of light, the nervous system in animals, and syphilis. Lundmark received 1,250 Swedish kronor: a non-trivial sum at the time; and, of course, a publishing contract with royalties. Three thousand copies of *Världsrymdens liv* were printed in 1926. Apparently the topic *was* suitable for popularization. As Lundmark's career unfolded, he continued to publish on extraterrestrial life in a range of media.

By the mid-1920s, Lundmark's career as an astronomer had both positive and not-so-positive prospects. On the one hand, he was receiving

international recognition for his work on galaxies. In 1920 at Uppsala University, he defended his PhD dissertation on the distance to M31: the Andromeda Nebula as it was called at the time, before it became established that it was, in fact, a large galaxy, as both Lundmark and Hubble argued. After that he worked at observatories on the United States' West Coast that were emerging as world centres for observational astronomy; and then at the Greenwich observatory (see e.g. Holmberg 1999; Kärnfelt 2009).

At the same time, Lundmark lacked a permanent position – those were few and far between in Swedish astronomy – and his economic situation was far from secure. This was one reason why he began to involve himself in popular science. Like many other Swedish scientists at the time, he had accumulated significant debts during his time at university, especially since he had come to Uppsala University from a very poor background. It is hardly surprising that the publisher's proposal interested him. That said, though the book royalties and the prize money *were* substantial, they were not the only rewards he sought in writing on extraterrestrial life.

Världsrymdens liv begins with a historical review – typical for Lundmark who, throughout his career, would come time and again back to the history of science and culture. He then proceeds to discuss the planets in the solar system, claiming the possibility of life on Mars. He was no sensationalist; his take on the discovery of extraterrestrial life – understandable in the wake of the Martian canal controversy – is that perhaps all science can do when it comes to such matters is to point to possibilities. This caution is evident elsewhere in the book; Lundmark writes, “the banner of critical thinking must be held high” – perhaps anticipating criticism from more traditionally minded colleagues.

The book rounds off with discussion of the panspermia hypothesis. Lundmark gives generous space to his successful Swedish predecessor in public discussion of astrobiology: Nobel-Prize-winning chemist and physicist Svante Arrhenius. He discusses thoroughly Arrhenius' theory and the criticisms levelled against it. He argues that Becquerel's work on the sterilizing effects of ultraviolet radiation in space ought to be checked independently and further verified before taken as proof against panspermia *à la* Arrhenius; till then, the jury on panspermia was still out. He proceeds to develop further Arrhenius' version of the panspermia hypothesis, using the tools of celestial mechanics to discuss the passage of spores between stars – a possibility for a professional astronomer like Lundmark that was not available to Arrhenius.

Through the second half of the 1920s, Lundmark remained quite positive towards panspermia and towards Arrhenius and his approach. In

an article on Arrhenius in *Populär astronomisk tidskrift* – the main popular astronomical journal in Sweden – Lundmark describes the problems caused by Arrhenius' lack of experience in astronomy, but also the virtues of Arrhenius' coming to the field from outside. Not being an astronomer, Arrhenius did not command the technical tools of astronomy with which one might further develop his version of panspermia: e.g., through addition of arguments based on celestial mechanics. On the other hand:

He could gain significant insights in celestial research without, as the case often is with professional astronomers, becoming confused and bogged down with innumerable conflicting details that make it hard to behold the grander scheme behind the varying phenomena. For a scientist of Arrhenius' personality it can be easier than for astronomers themselves to see where the results are heading. (Lundmark 1927)

In many ways, Lundmark shared this style of personality; but it did not endear him to the academic astronomy establishment. Eventually, he obtained the permanent position he coveted, winning the competition for a Lund professorship in 1929. At the same time, his position in Swedish astronomy became quite peripheral compared to the astronomers working at Uppsala and Stockholm/Saltsjöbaden. He developed an increasingly frosty relationship with certain of his fellow astronomers, such as Bertil Lindblad and his group at the Stockholm observatory, at the same time as finding an increasingly warm relationship with the general public (Kärfelt 2009, Holmberg 1999). As the years went on, he was prolific both as an author and public intellectual, publishing on a large number of subjects, some quite distant from astronomy: history of science, August Strindberg, botany, and so on. He was an astronomer with many faces: a generalist looking in many directions to gain a synthesized image of Man's position in the universe. To his colleagues in professional astronomy, this smacked of amateurism: the negative consequence of too-broad interests and too-speculative outlook. To many others, he became Mr. Astronomy in Sweden: a central public figure whose publishing and public speeches aroused the interest of many in astronomy and the sciences.

Lundmark shared Arrhenius' broad outlook on scientific matters and his positive view of panspermia. In the late 1920s, he was publishing much of his work outside of the professional journals. When Arrhenius died, Lundmark was chosen to oversee completion of the half-finished eighth and final edition of *Världarnas utveckling* ("Worlds in the Making"): Arrhenius' major work in astrobiology. Entering the 1930s, he was well established in the academic world at the same time he continued his non-academic publishing. He was an increasingly public figure, a staple of the

Swedish media, an oft-heard voice on radio, a public lecturer who penned articles on a diverse set of questions. He wrote on extraterrestrial life for newspaper and magazine articles. He continued to write for many types of publications, including those where his astronomer colleagues would never publish.

Many of the themes of Lundmark's first book on extraterrestrial life reappeared in later publications. Meanwhile, international publishers showed increasing interest in spreading that early work internationally. Translations were discussed; in 1930, Brockhaus published a German translation. As said, Lundmark edited and contributed original material to the eighth edition of Arrhenius' *Världarnas utveckling*. In 1935, his own *Livets välde* ("The Realm of Life") was published by Bonnier's: one of the leading publishers in Sweden with a long history of publishing in the field of popular astronomy. The initiative came from Bonnier's. In March 1930, on publication of the German edition of *Life in the Universe*, Bonnier's contacted Lundmark wishing to publish another, enlarged and revised book on the topic. Lundmark the junior astronomer of the mid-1920s had published what was a slim volume from a small publisher: Lindblad's. Lundmark the established astronomer and public figure of the 1930s had the printing and marketing resources of the nation's premier publisher. The resulting lavishly illustrated (and expensive) volume was released in late 1935 with good exposure in Bonnier's prestigious Christmas catalogue. Together with the nation's leading authors, historians, and heroes, he had arrived at a kind of cultural Parnassus. He received an advance of 4,500 Swedish kronor for the book – about a third of the yearly income of a Swedish university professor – with the promise of royalty checks in future.

Boundaries

These books on extraterrestrial life sold as popular works. Reading them, though, one gets the feeling they were about more than just popularization. Surely, that feeling is present not only in this reader but also in the author: for Lundmark, life in the universe just *is* a topic fit for scientific discussion. Written by a scientist, these works popularized both facts and methods. Some parts are quite advanced for being popular works, at the same time they remain accessible. Their style is in keeping with his other popular publications. He argued consistently for presenting a diversity of results and hypotheses in popular forums and not just catering to the

current scientific consensus (see Kärnfelt 2004; Holmberg 1999, 187–190).

Lundmark argued that extraterrestrial life had become a scientifically relevant subject – it fell within the boundaries of science – even as it had earlier mostly been about hunches and flights of fantasy. Advances in astrophysics made it possible to treat scientifically, as commented upon positively by an anonymous reviewer for *Populär astronomisk tidskrift* in 1926. A review in the same journal of *Worlds in the Making* – written in 1929 by Carl Schalén – was much more sceptical of Lundmark's/Arrhenius' position, describing it as too speculative. A similar tone is evident in Bertil Lindblad's 1936 review of *The Realm of Life*. Lindblad – the foremost Swedish astronomer of the time – uses his review in what was a leading popular publication to state what he saw as the problems inherent in any such multidisciplinary undertaking as astrobiology. So, for example, because he was not a biologist, Lundmark clearly errs where he writes on biology: a not-uncommon argument against the scientific study of extraterrestrial life in the history of modern science.

Concluding remarks

Lundmark addresses quite advanced issues in his books on extraterrestrial life: e.g., *Världsrymdens liv* includes a page of dense equations. At the same time, he uses the books to weigh various ideas one against another. At the time, no established arena existed for astrobiology – or, as Lundmark liked to call it, cosmobiology. The openness of the field suited his open style. He intended his books not only to popularize knowledge already gained and secured, but also to provide a laboratory for discussing matters that remained quite open. He used them as a platform to discuss matters of interpretation in measurements and to develop theories and instruments of importance to astrobiology in ways not really possible in the standard astronomical journals where he published his scientific work. His books not only served to popularize – and popular they were, among both readers and publishers – but also played a serious role in scientific discussion. They cast real doubt on the possibility of making any clear-cut distinction between the popular and scientific literature of the 1920s and 1930s on extraterrestrial life. They reveal as well the importance of publishers and book markets when writing the history of astrobiology.

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