

THE MOVING EARTH

directed by Lars Becker-Larsen.
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2009. Copyright Date: 2008. <<http://icarusfilms.com/new2009/mov.html>>.

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Lars Becker-Larsen's production *The Moving Earth* offers a splendid chronicle of the scientific shift brought about through studies of planetary motion during the scientific revolution of the 17th century. The name of the film refers to the work establishing that Earth is a moving planet, and the broadly based content tells the story of this discovery. Overall, the narrative highlights the controversy between geocentric and heliocentric perspectives that was a part of those debates; we learn of how the key thinkers in Renaissance Europe who studied the celestial framework developed the ideas that ultimately moved science away from the Church's doctrine that the earth was the immovable center of the universe. Although the story is well known, this presentation is robust and includes some degree of in-depth analysis. There is a good measure of reference to Plato and Aristotle as well as some extension of the ideas through the 19th century when Foucault's pendulum showed the rotation of the earth. Performances in key settings, period garb and insightful commentary provide the viewer with a full sense of the events and how the natural scientists overturned the Aristotelian idea of the "Unmoved Mover" (to oversimplify, this idea is used to explain

how the universe was first set into motion; medieval scholasticism later translated Aristotle's "Prime Mover" into the Christian God).

The strength of the film is its multi-dimensional quality. Visual elements such as historical engravings, paintings, animations and manuscripts aid the presentation immensely and bring a realistic element into play that knits the ideas of several periods of history together into a seamless fabric. Much of this is quite subtle. For example, showing manuscript pages and still artwork might seem mundane, but in this case I found that the variety of these backdrops created a vivid sense of the cultural life of the times.

Particularly insightful are the discussions of topics involving the clash between science and religion, exemplified by the treatment of Galileo (and the Pope's 1992 apology for the legal process against Galileo). In this case, George Coyne, former director of the Vatican Observatory, points out that the Church's lukewarm admission of responsibility for its persecution of Galileo left much to be desired and that the conflict between science and religion evident at that time is still a part of cultural discussions. (Coyne's candor isn't totally surprising. He is also a vocal opponent of intelligent design theory, which often sneaks a Creator God in through the back door. Indeed, some say Coyne was forced out of his Vatican position because of his willingness to speak publicly about his views opposing intelligent design.)

One of the most powerful unstated aspects of this production is the way it brought to mind debates outside its topic. The producer understood the power of these old manuscripts in conveying the ideas of the thinkers the film presented. Looking at the repeated use of the physical volumes, I wondered how the e-books that are capturing our imaginations today will fare in a few centuries. In the film, the pages and the outside boards of these very old books serve as more than visual props that helped make the research come alive. Shots of their spines, title pages and internal pages, particularly the notebook pages filled with charts and graphs, effectively demonstrate

that the ideas that drove the research were not pulled from the air. When the actor playing Kepler pores over Tycho Brahe's years of collected data, he conveys the intensity of Tycho's observations of the heavens as well as Kepler's desire to solve the problem of motion. I was enthralled even though I was familiar with many of the details and found myself moved to think about details I had previously taken for granted.

Still, a marriage of these artifacts with new technologies occurs. Many of the visuals that accompany the film are "moving" because of the nature of the work. One good example of how the director used new technologies to his advantage is the animation of the notes on a page of Kepler's *Harmonices Mundi* (The Harmony of the Worlds, 1619). Here, watching the notes as one listens to them succeeds in elevating the discussion of Kepler's work relating the harmony and congruence in geometrical forms and physical phenomena to the harmonic proportions in music.

I believe the portraits of Tycho Brahe and Kepler were the strongest, at least in terms of presenting new details on their work that stoked my curiosity. For example, I never before thought about whether Kepler conceived all of the images in his publications or had an artist do this work for him. Many, like his Platonic solid model of the solar system from *Mysterium Cosmographicum* (1600), are well known. I had always assumed he did them himself, but I did not fully conceptualize how many drawings were in the book. Others, like the frontispiece of the *Rudolphine Tables*, seem unlikely to be his.

By extension, I found that the abundance of visual material, which added immensely to the script, also left me disappointed in terms of its informational value. Indeed, my one complaint with the production is that so many of the paintings, drawings and prints, which appeared to be from the period discussed, are not attributed. That said, citing the creator of the work during the script would have been distracting, so perhaps this criticism is unfair. Moreover, when I looked one up myself, a painting of Cardinal Bellarmine (the “Hammer of the Heretics” who served as one of the judges at the trial of Giordano Bruno and concurred in the decision that condemned him to be burnt to death as an obstinate heretic), I found that the painter is unknown.

One of the points frequently mentioned in *The Moving Earth* is that, before the work of these 17th-century scientists combined the movements of the earth with those of the heavens, it was believed that the Earth was the center of the universe and that other objects go around it. In addition, heaven was considered a domain separate from Earth. Listening to quantum theorists explain that the quantum domain is unlike that of our Newtonian reality has always reminded me of the debates that ushered in modern science. At the end of this film, the astronomer Owen Gingerich points out that the actual “proof” of the Newtonian framework was not provided until the 19th century (with Herschel’s discovery of Uranus, measurements of parallax and Foucault’s pendulum showing the rotation of the earth). He then goes on to say that cases such as this show that proofs do not play too strong a role in our understanding of science. Rather, what we are looking for is a coherent picture, and that was provided by the mathematics of Isaac Newton. In effect, this sequence also puts its finger on

something that kept coming to mind as I watched the film. The sequence on Tycho Brahe, who is known for his accurate and comprehensive astronomical and planetary observations, reminded me of Niels Bohr, another Danish scientist, who did transformative research in physics. Bohr, of course, lived much later and is known for his foundational contributions to understanding atomic structure and quantum mechanics, for which he received the Nobel Prize in Physics in 1922. Yet, both were involved in cosmological frameworks that they propelled forward for others to finish.

Like many, I was introduced to the key figures and events in this production at a young age. Thus I am aware of this film’s potential as a classroom tool. Having looked at the details from many perspectives over the years, I find it astonishing that this presentation is so refreshing, because much of the narrative did not present new ideas or change my thinking. It is how this production is brought to life with manuscripts, paintings, superb animations and dramatic re-creations of key events that sets it apart. The script brings the events to life and captures scientific creativity as well as a cultural climate governed by a Church that felt threatened by the new ideas of Copernicus, Tycho Brahe, Galileo, Johannes Kepler, Giordano Bruno and Isaac Newton. Another component of note is that the commentary by experts (Simon Schaffer of Cambridge University, John Christianson of Luther College, Gingerich of Harvard University, Coyne of the Vatican Observatory and Patricia Fara of Cambridge University) adds immensely to the performance and carefully chosen visuals. Others, too, have noted the excellence of this presentation. To date, *The Moving Earth* has won several awards. These include the Grand Prix at the 13th AVICOM Film Festival, Turin; the Best Documentary Film at the Vedere la Scienza Festival, Milan; and the Grand Prix at the 46th International Festival TECHFILM 2009, Prague. If *Leonardo* had a rating system, I would give *The Moving Earth* five stars.

As I prepared to turn in this review, it became clear that a postscript is necessary. As noted above, this film conveys that the details surrounding moving-earth research are still alive in cultural discourse, particularly when science and religion are discussed in tandem. Even as I write, a new event has arisen to add to the chronology. On 22 May 2010, Polish priests reburied the 16th

century astronomer Nicolaus Copernicus and declared him a universal hero. Nearly 500 years after he was put to rest in an unmarked grave, his remains were sprinkled with holy water. The new tombstone, which is decorated with a model of the solar system, identifies this revolutionary astronomer as the founder of heliocentric theory and a church canon (a cleric ranking below a priest).