

RECEPTION AND DISSEMINATION OF AMERICAN AMATEUR TELESCOPE MAKING IN SWEDEN

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Abstract: This paper discusses the appropriation of the American Amateur Telescope Making (ATM) movement in Sweden in the 1940s and 1950s. A key player was the Swedish Astronomical Society, which in 1943, and inspired by the American example, launched a campaign to raise interest in ATM and disseminate the necessary knowledge amongst potential amateur astronomers. The campaign was successful and in just a few years it quadrupled the number of amateurs with access to telescopes. Swedish amateurs kept on building telescopes through the 1950s, but the activities then stalled with the introduction of cheap mass-market telescopes. The appropriation of ATM in Sweden is an important example of how technical innovations have shaped the course of amateur astronomy.

Keywords: Sweden, amateur astronomy, ATM, Swedish Astronomical Society

1 INTRODUCTION

Amateur astronomers spend a lot of time with their instruments.¹ They make their observations, tweak and tinker with them, build and rebuild them, even collect them. Many amateurs have several specialized instruments for particular uses, including large-aperture Dobsonians for deep sky observing, high-end refractors for planets and astrophotography, and astronomical binoculars for comets. Without these instruments, there would be no amateur astronomy. One result of the central role played by these instruments is that innovations in optics, mechanics, electronics and manufacturing techniques have the potential to change the course of amateur astronomy. Cheap mass market telescopes made available after WWII put the heavens within reach of new demographic groups. Deep sky observing took off with the introduction of the large-aperture Dobsonian in the 1970s. Starting in the early 1990s, commercial CCD cameras gave rise to modern astrophotography, and so on.²

One early and particularly important development was the rise of the Amateur Telescope Making (ATM) movement. ATM developed in many countries, but the American tradition was arguably the most important (Cameron, 2010). Launched in the 1920s, and in close association with *Scientific American*, it had a profound impact on amateur astronomy. But its reach went far beyond the borders of the United States. Borne by magazine articles, handbooks and letters, the ideas and techniques of the American ATM movement travelled far and was eventually appropriated by many other amateur cultures.

In this paper I will discuss one example, the reception and dissemination of the American ATM tradition in Sweden during the early 1940s and later.

2 THE NORTH-AMERICAN ATM MOVEMENT

Early twentieth century amateur astronomy was defined by the refractor. The 80-mm achromatic model was a typical instrument of the time. It was often manufactured by the same optical companies—e.g. Alvan Clark & Sons in the United States, Carl Zeiss in Europe—that supplied professional astronomers. It was also quite expensive, which tended to leave amateur astronomy to wealthy practitioners (Cameron, 2010). These circumstances give context to a seminal article titled “The Poor Man’s Telescope”, which was written by American optician Russell W. Porter (1871–1949) in 1921 and published in *Popular Astronomy* (Porter, 1921). It was this article that launched the American ATM movement.

According to Porter, the poor man’s telescope was not a refractor, but a reflector. The mirror was ground by hand from a disk of raw glass into a spherical or parabolic shape (Figure 1), polished, silvered to make it reflective, installed in a simple wooden tube and supported by a mounting. The article details the mirror-grinding process. It also describes the bait that readers were supposed to rise to:

It is really remarkable, considering the prices asked for telescopes today, that one possessed with patience and a little time can produce a very powerful and efficient instrument at so small a cost. (Porter, 1921: 527).

The article had no immediate impact, but a small group formed around Porter and started to build telescopes. Some years later, the group was formally organized as the Springfield Telescope Makers. Later it became the *avant-garde* of the ATM movement, particularly through the Stellafane Conventions that began in 1923 and have been attracting participants from all over the United States ever since (Cameron, 2010: 168; Stellafane).

A couple of years later, Albert G. Ingalls (1888–1958), the newly appointed Editor of *Scientific American*, came across Porter's article. Ingalls realized that amateur telescope making fitted perfectly with the journal's goal of offering more space to various kinds of do-it-yourself projects. He contacted Porter (Figure 2), and embarked on a long and successful series of articles concerning every aspect of telescope making. Readers were highly receptive. After just a couple of years, the journal estimated the number of active telescope makers at 3,000, some of whom constructed 200-mm reflectors for as little as \$12—compared to the several hundred dollars for commercial equivalents (Cameron, 2010: 178). The success convinced Ingalls to edit the articles for a book, including an out-of-print ATM manual by Irish astronomer William F.A. Ellison (1864–1937). The first edition of *Amateur Telescope Making* was published in 1926 (Ingalls, 1926). By 1932, close to 10,000 copies had sold. Ten years later, there were over 60 ATM clubs in the United States (Cameron, 2010: 190). The book is still regarded as the 'bible' of ATM.³

ATM kick-started American amateur astronomy. Although the materials and methods of telescope making had been around for a long time—the invention of glass mirror silvering by Léon Foucault (1819–1868) in 1857 was the starting point of the modern tradition (Tobin, 1987)—Ingalls and Porter managed to make an attractive package out of it and sell it to the American public. The key concept was that virtually anyone could build a telescope. You did not need an optician's workshop or specialized training. It could be done in a garage or basement. Besides very affordable raw materials, it required only time, endurance and thoroughness. Many Americans took up the challenge. The number of active amateurs grew exponentially in the decades to come, reaching the tens of thousands by mid-century. At the same time, amateur astronomy was no longer limited to the educated and wealthy but encompassed ordinary people as well (Cameron, 2010; cf. Williams, 2000).

The ATM movement extended far beyond the borders of the United States. The articles in *Scientific American*, as well as the book Ingalls put together, brought both the theory and methods to other cultures. In the 1940s amateur astronomy got off to a flying start in Sweden as a result.

3 EARLY TWENTIETH CENTURY AMATEUR ASTRONOMY IN SWEDEN

The Swedish Astronomical Society was founded in 1919. There were no other astronomical associations in Sweden at the time at either the



Figure 1: Mirror grinding (after Barton and Joseph, 1951: 171).

national or local level. Inspired by both the professionally oriented Royal Astronomical Society in England and the British Astronomical Association (with its emphasis on amateurs), the new Swedish organization adopted a number of goals. It wanted to serve the needs of professional astronomers while providing a forum where amateurs and members of the general

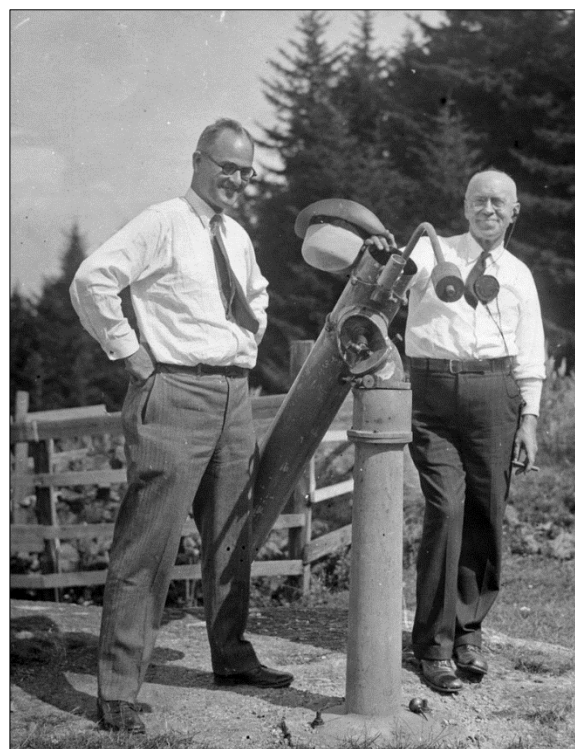
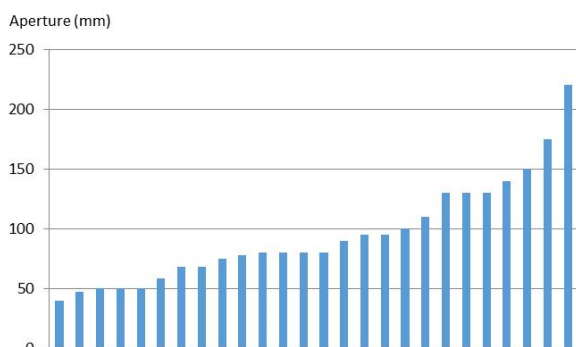


Figure 2: Albert G. Ingalls (left) and Russell W. Porter (after Beaty, 2015).

public could interact with astronomers (Kärnfelt, 2004: Chapter 5; 2015).

During the first few years, the Society focused largely on amateur astronomy. Sweden could muster only a handful of amateur astronomers, so one of the main objectives was to recruit a large group of amateurs and train them in the service of professional astronomy (Kärnfelt, 2004: 188). A key tool was the Society's mouthpiece, the ambitious *Populär Astronomisk Tidsskrift* (*Journal of Popular Astronomy*), a biannual that was first published in 1920. The journal included a number of long, popular articles about academic astronomy, as well as some material on amateur astronomy. Guides for performing various types of observations, information about amateur observatories, discussions of astrophotography, etc., were among the features. For a number of years, the Society had a small public observatory in Stockholm—the first of its kind in Sweden—for the purpose of general enlightenment and the opportunity for amateurs to use the 130-mm Carl Zeiss refractor. But these and similar initiatives ultimately failed to



scope for himself, or even bought one for that matter, but he was clearly among the first influential members of the Society to realize the potential of ATM.

Grabe spoke on the subject at the Society's 1943 annual meeting. Drawing on Ingalls' book, he explained the basics of telescope making, asserting that even a "... handy boy ..." could do it (Grabe, 1943: 15). He urged the Society to actively

... encourage amateur telescope making, which, especially in the United States, is pursued with great intensity in therefore especially formed club and in close association with *Scientific American* ... (ibid.).

This was the start of the Swedish ATM movement. Buttressed by a positive response to his talk, Grabe teamed up with optical engineer Ragnar Schöldström (1889–1981) to promote ATM in Sweden. A summary of Grabe's talk was published in the journal (Grabe, 1943). In the next issue, Schöldström—later to become the Russell W. Porter of the Swedish tradition—wrote a rather technical article on the knife-edge test to determine the correct shape of the mirror during the grinding process (Schöldström, 1943a). He also produced a more extensive ATM manual. He subsequently wrote more general articles for various magazines about his experience building telescopes (Schöldström, 1943b, 1943c and 1944).⁶ The purpose of the articles was not so much to provide instructions as to promote the idea that realizing the dream of having a telescope was possible even with limited resources. Or as Grabe (1943, 15) put it: mastery of mirror-grinding required only three qualities: "... patience, cleanliness and accuracy ..."

Meanwhile, these and similar publications were followed up at the organizational level. At Grabe's initiative, the Board of Directors of the Society appointed a Committee to promote ATM. In addition to Grabe, the Committee consisted of astronomers Bertil Lindblad (1895–1965), Gunnar Malmquist (1893–1982) and Yngve Öhman (1903–1988), as well as engineer Erik Forsberg (1875–1946) (Protokoll, 26 February 1943). Öhman, who at the time worked at Stockholm Observatory, was the only Committee member who had previous first-hand experience as an amateur astronomer. Among the first events arranged by the Committee was a meeting at an optical workshop in Stockholm, at which Schöldström talked about his ATM experiences (Anonymous, 1943). In connection to the Society's 25th Anniversary the following year, they put together a small exhibit of amateur-made telescopes. The exhibit was reported in the press. One of the items was Schöldström's masterpiece, a 210-mm reflector,

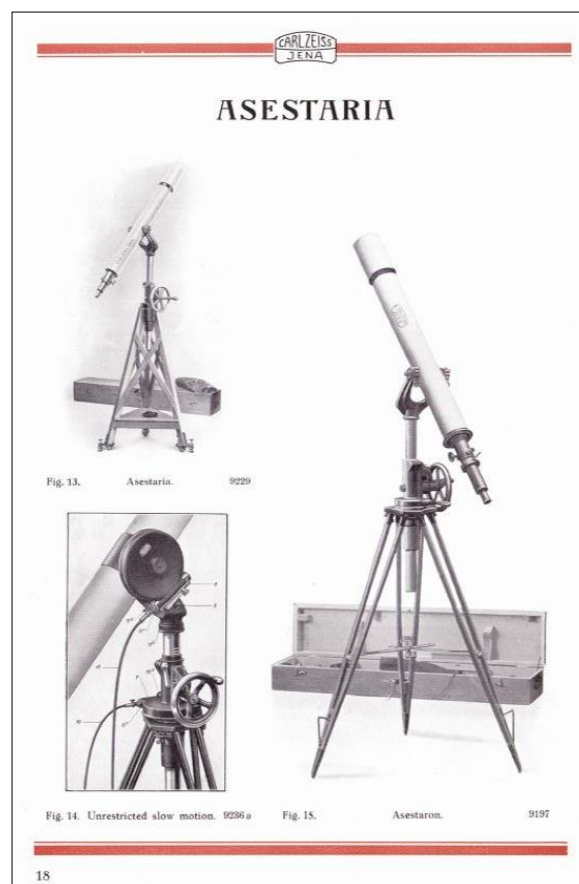


Figure 4: The "Asestaria" manufactured by Carl Zeiss in Jena. This 80-mm refractor could be bought with an achromatic or a more expensive apochromatic objective. The slow motion cables shown in the image at the bottom left was an extra and is not included in the price cited above (after Carl Zeiss Jena, 1928: 19).

as well as a simpler 135-mm reflector that was built according to Schöldström's instructions by Air Force Officer Per Anders Kinnman (b. 1913) (Figure 6) (Anonymous, 1944; Öhman, 1944a).

While the Society had failed to attract the attention of amateur astronomers in the 1920s, it fared better this time around. Many people, both inside and outside of the Society, responded positively. But awaking interest was not enough to persuade amateurs to build telescopes. Although the technique of mirror-grinding was avail-



Figure 5: Alf Grabe (after *Svenskt Biografiskt Lexikon*).

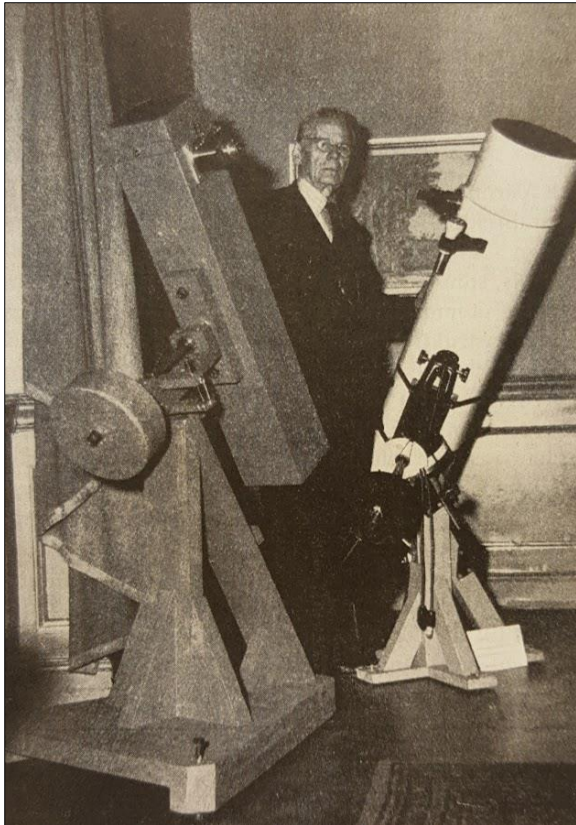


Figure 6: Nils Nordenmark, Secretary of the Swedish Astronomical Society, poses with two homebuilt telescopes at the Society's ATM exhibition. The white instrument to the right is Schöldström's; the bulky one to the left is Kinnman's (after Öhman, 1944: 100).

able to virtually anyone, ATM also demanded access to a great deal of information and raw materials (Figure 7). First of all, you needed detailed instructions on how to go about performing the various steps of mirror grinding, not to mention some basic ideas about building the

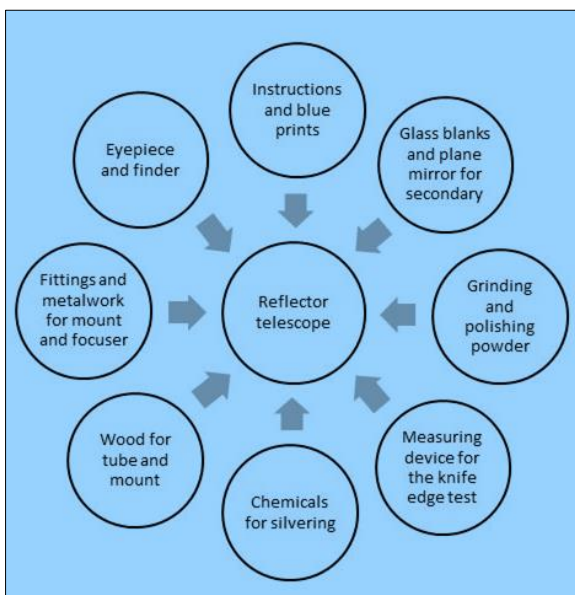


Figure 7: Information and material needed to build a telescope (diagram: Johan Kärnfelt).

tube and mount. Then you needed to get your hands on glass blanks, grinding and polishing powder, a plane mirror for the secondary, chemicals for silvering, and wood and fittings for the telescope. Before grinding, you also had to build a device for the knife edge test. Finally, a suitable eyepiece was required once the telescope was complete. You could not make one yourself, but had to buy it from an optician or salvage it from a trashed microscope. All of this had been available long before the Society started to promote ATM, but only to those who knew what they were looking for and where to find it.⁷

The Society's most important achievement when it came to ATM, besides promoting the idea itself, was to create the needed infrastructure for telescope makers. To begin with, Ragnar Schöldström wrote a lengthy compendium on telescope making (Schöldström, 1943d). It was clearly inspired by Ingalls' book, as well as his own experience as an optician. The project described in the compendium targeted a 150-mm reflector, which could easily be upgraded for more experienced telescope makers. Schöldström also arranged for the compendium to be distributed by Clas Ohlson & Co., a mail order firm specializing in technical manuals and hobby products. The compendium was advertised for the first time in the 1944-45 Clas Ohlson catalog (Figure 8). Based on an agreement with Schöldström, the company also started to sell mirror grinding materials. A subsequent announcement stated that a telescope could be built for less than SEK 100, a fraction of the price of a commercial counterpart (Advertisement, 1944/45).

Still you needed an eyepiece and a finder, which could not be bought from Clas Ohlson & Co. Schöldström's compendium is rather vague in this regard, suggesting only that amateurs try to find a suitable loupe or microscope eyepiece (Schöldström, 1943: 25). Had it not been for yet another arrangement by the Society's ATM Committee, this might have been the stumbling block for Swedish ATM. Astronomer Yngve Öhman negotiated a deal with an optical company to supply the Society's members with lens kits for a 17-mm orthoscopic eyepiece and a 7.5× finder.⁸ Sockets for the lenses were not included but could be ordered from a mechanical firm in accordance with another agreement set up by Öhman. The package was first advertised in the Society's journal in 1944. Members could buy it for SEK 15. Since the supply was limited, however, they were allowed to do so only if they submitted a certificate stating that they had actually completed a telescope of their own (Öhman, 1944b).

Spegelteleskop



Handbok Nö BE 36. För den som själv önskar tillverka ett 15/150 cm. spegelteleskop, (stjärnkikare) förstörande från 60–240 gånger och som till sina optiska egenskaper är fullt likvärdigt med en kikare i 1000:— kr. klassen har vi låtit utarbeta ritningar och monteringsanvisningar för ett parallaktiskt stativ jämte en utförlig instruktion för tillverkning av såväl de optiska som mekaniska detaljerna, utarbetad av civilingenjör R. Schöldström.

Vi tillhandahåller även glasskivor för huvudspegel och slipverktyg, all behövlig material för slipning och polering m.m. Prislista på erforderlig material medföljer.

Pris för arbetsritningar jämte beskrivning **4:85**

Vad kan man se i teleskopet?

Månen är ett tacksamt objekt, och om man har anlag för teckning är det en intressant uppgift att rita av ett visst ringberg under olika belysningsvinklar, eller att uppskatta färgskiftningarna på månens hav. Planeterna Venus, Mars, Jupiter och Saturnus äro också tacksamma objekt för den teckningskunnige. Särskilt Jupiter med sitt ständigt skiftande molntäcke, som redan efter någon timme, på grund av planetens snabba rotationstid, visar tydliga skillnader i sitt utseende, är lämpad för de första försöken i planetforskning. En annan intressant uppgift är att följa de fyra stora Jupitermånarnas rörelser, observera månförmörkelserna och se månarnas skuggor vandra fram som små svarta nätt och jämnt synliga prickar.

Saturnus med sitt säregna ringsystem är också en himlakropp som "gör sig" i vårt teleskop. De närmaste åren äro särskilt lämpade för Saturnusobservationer, då ringen synes i sitt mest öppna läge. Man bör även kunna se de fem ljusaste månarna.

Venus visar oss en ständigt bländande vit yta och är intressant på grund av att den har fasér och alltså precis som vår måne ibland är "ny", ibland i första kvarteret, ibland "full", samtidigt som dess skenbara storlek ändras avsevärt.

Mars kan endast med fördel observeras vid de tider den är närmast jorden. Man kan då se de vita polkalotterna och antydningar till d. s. k. haven.

Dessutom är det intressant att studera solen, fixstjärnorna, kometer, nebulosor, stjärnhopar m. m.

Figure 8: Advertisement for Schöldström's ATM compendium in the Clas Ohlson catalogue of 1944/45. The 150-mm reflector displayed is the end result following the instructions. Cf. Figure 6 above (after Advertisement, 1944/45: 90).

5 IMPACT

The impact of the Society's ATM initiative is difficult to gauge. But a few indications permit an assessment of the outcome.

As the Society sold off its inventory of lens kits, Öhman made sure to report its progress in the journal. In 1948, once the inventory had been depleted, Öhman could name over 60 amateurs who had bought the kit and completed their telescopes (Öhman, 1948). This is not much in absolute numbers, but if we assume that the telescopes listed in Figure 3 were still in use, it actually means that the number of amateur telescopes had quadrupled in just a couple of years.

Amateurs continued to build telescopes in the years to come (Figure 9). A definitive indi-

cator of ATM activity—at least until 1960 when others entered the market—would have been the sales figures for the glass blanks from Clas Ohlson & Co. Unfortunately, they are no longer available. But we do know that the company's mimeographed pricelist for mirror grinding materials was issued in about 500 copies yearly well into the 1960s.⁹ Since the number of copies was stable for many years, it permits a reasonable estimate of the circulation of the lists. Assume that one out of 20 of those who consulted the list actually bought glass blanks and built a telescope. Then about 25 new telescopes were built every year. This simple calculation suggests that the Swedish ATM movement, from its launch in 1943 until 1960, produced somewhere in the neighborhood of 400 new instruments and potentially as many new amateurs.

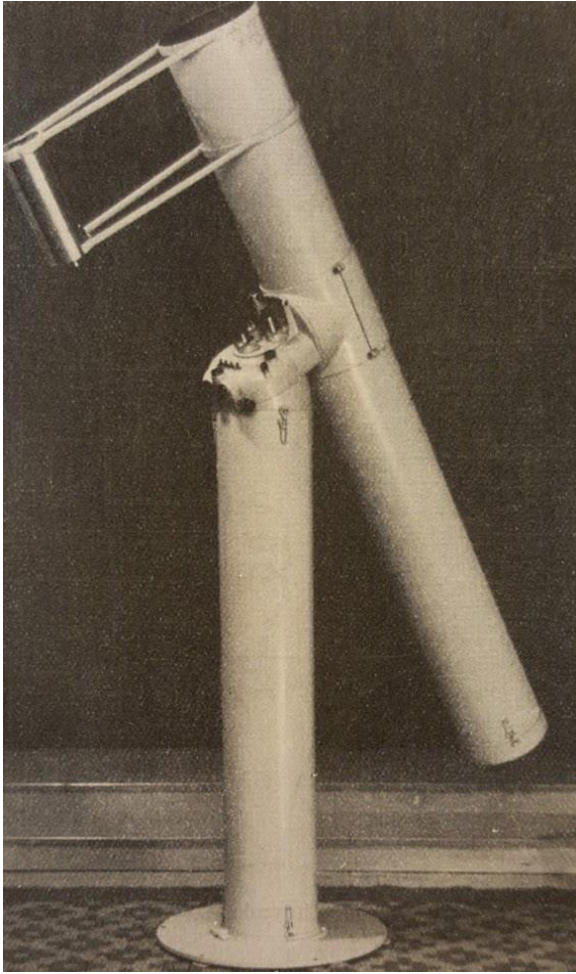


Figure 9: The Springfield-mounted telescope built from steel pipes by engineering teacher David Lindhed in 1945, following an instruction in *Amateur Telescope Making*. The mount, allegedly invented by Russell W. Porter, uses two secondary mirrors to lead the light cone through the polar axis and then to the eyepiece on top of the pier. The construction allows the observer to observe in the same position regardless of how the telescope is pointing (Lindhed, 1946: 56).

Swedish ATM took a new turn in the late 1950s. A sudden inflow of cheap mass-market instruments changed the world of amateur astronomy forever. New manufacturing techniques had enabled Goto Optical Manufacturing in Japan and others to produce telescopes for a fraction of the previous cost. These telescopes found their way into Sweden when Clas Ohlson & Co. started selling them in 1956. Suddenly you could buy a simple 62-mm refractor with a tripod, eyepiece and finder for less than SEK 400 (Figure 10), one-fifth of the monthly income of a typical office worker (Swedish National Board of Health and Welfare, 1965: 3). Under these circumstances there was no longer a financial incentive for mirror grinding and telescope making—at least among entry-level amateurs who were satisfied with smaller apertures. ATM became the domain of advanced amateurs in search of larger apertures, specialized instruments or optical perfection.



Figure 10: The cover of the *Clas Ohlson catalogue* for 1956-57. The telescope displayed is the 62-mm refractor mentioned in the text.

6 CONCLUDING REMARKS

ATM had a definite impact on Swedish amateur astronomy of the 1940s and 1950s. In a country that was barely aware of amateur astronomy before 1940, the ATM movement increased the number of practitioners from a few dozen to hundreds. This was arguably the Swedish Astronomical Society's most important contribution to amateur astronomy in the first half of the twentieth century.

The introduction of ATM also opened Swedish amateur astronomy up to other developments. With several hundred participants, the community reached a critical mass. The Swedish Astronomical Society tried its best to handle the newborn interest, but local clubs did most of the organizing. Beginning in the mid-1950s, amateur clubs were formed in most big cities, often with first-generation ATM enthusiasts in leading positions. All the accoutrements of modern amateur astronomy followed: club observatories, bulletins, workshops, star parties, observing projects, etc. It is safe to say that the ATM movement, as imported from the United States in the 1940s, laid the foundation for the later development of Swedish amateur astronomy.

ATM proved to be of great importance in both the United States and in Sweden. For

several decades, it was the poor man's route to the stars, a means of circumventing the price tags for commercial telescopes. More research needs to be conducted, but similar patterns are sure to emerge for other countries. The role that the specific American tradition has played in these cultures is, however, another question. Germany and the UK had their own ATM traditions, probably making them less receptive to American influence (for the British tradition, see Chapman, 1998). How about Greek, Italian and Russian amateur astronomy? Another issue is the nature of these influences. Swedish amateurs were inspired by and learned a great deal from American ATM, although appropriating it to a pre-existing optical tradition. Several leading Swedish ATM enthusiasts, including Ragnar Schöldström, had acquired professional know-how as opticians. The various ATM traditions have certainly had their own particular flavors depending on local optical traditions, the point at which they emerged and socio-economic factors.¹⁰

7 NOTES

- 1 This paper is an offshoot of a recent research project concerning the history of Swedish amateur astronomy. This three-year project, directed by the author and Gustav Holmberg from Gothenburg University, was launched in 2013 and funded by the Bank of Sweden's Tercentenary Foundation. The paper draws on a longer chapter in Swedish for a forthcoming monograph (Holmberg and Kärnfelt, n.d.).
- 2 Scientific instruments have received renewed attention from historians of science during the last few decades (e.g., see Taub, 2011; van Helden and Hankings, 1994). From an American point of view, the instruments of amateur astronomers have been studied by Cameron (2010). Australian and New Zealand ATM is discussed by Orchiston (2003; 2016: Chapter 12) and Orchiston and Bembrick (1995). Finally, the Spanish ATM tradition recently has been discussed by Ruiz-Castell (2016).
- 3 A second expanded edition appeared in 1928, followed by several others. The current edition contains three volumes totaling more than 1,500 pages (cf. Willmann-Bell Inc.: www.willbell.com/tm/tm7.htm).
- 4 The sources are too many to cite here, but they include articles about amateur observatories published in journals, correspondence with astronomers, recollections, biographical notes, etc. Even though additional telescopes were probably in use, especially in the lower aperture range, the graph represents a good estimate of the scene among Swedish amateurs in the early twentieth century.
- 5 As far as I know, no Swedish pricelists have been preserved, so this estimate is based on a British counterpart for the 1928 Carl Zeiss catalog and historical exchange rates. The instrument in question, the "Asestaria," can be found in Carl Zeiss (Jena) (1928: 19). Prices are from Carl Zeiss (London) (1928). Historical exchange rates are from the Bank of Sweden (2016).
- 6 Schöldström's piece in *Teknik för alla* was followed by three do-it-yourself articles by Olle Norelius (1943).
- 7 To my knowledge, Swedish amateurs made only two attempts to build telescopes before the 1940s (not counting the above-mentioned glass lens telescopes). One was an utter failure. In the early 1910s, artist Hans Erlandsson, inspired by the Herschels, tried to cast and grind a 370-mm speculum mirror (Erlandsson, 1941). Once finished and tested, Erlandsson notes, the mirror was powerful enough to light a cigar at the focal point while the mirror was aimed at the Sun, but unfortunately the optical quality made it useless under the stars. He later sold the mirror to a scrapyard. A more successful attempt was made by police officer, Tore Sjögren, in the early 1930s. Using a German ATM manual and hunting down all necessary material himself, he managed to grind a small mirror and build a fully operational reflector telescope (Sjögren, 1941). Later Sjögren became an important promoter of ATM within the Gothenburg circle of amateur astronomers.
- 8 With regard to Öhman, see Holmberg (2008). A journal kept while he was a youthful amateur has been preserved in the Yngve Öhman archives, Center for the History of Science, Royal Swedish Academy of Science, Stockholm.
- 9 Editions from written remarks on pricelists for mirror grinding materials in Clas Ohlson archive, Insjön (Pricelists, 1955, 1957, 1965, 1966 and 1967).
- 10 A recent paper on Spanish amateur astronomy during Franco's rule indicates that ATM became integral to the goal of creating spaces for instruction and socialization that were not directly controlled by the regime (Ruiz-Castell, 2016). Previous and yet un-published research has demonstrated that ATM also played a vital role on the Portuguese scene when naval officer and advanced amateur astronomer Conceição Silva (1903–1969) took charge of the Gulbenkian Planetarium and started to use it as a platform to promote amateur astronomy (Raposo, 2014, cf. Ré, 2007). Lastly, a study of the Australian ATM tradition has shown how some advanced

amateurs chose to appropriate and develop more complex telescope designs popularized in the USA, including Buckroeders, Makutovs, Schiefspeiglers and Wrights (see Orchiston, 2003).

8 ACKNOWLEDGEMENTS

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