The History of AAVSO Charts, Part II: The 1960s Through 2006

Kerriann H. Malatesta
AAVSO Headquarters, 49 Bay State Road, Cambridge, MA 02138

Michael A. Simonsen
2615 S. Summers Road, Imlay City, MI 48444

Charles E. Scovil
Stamford Observatory, 39 Scofieldtown Road, Stamford, CT 06903

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Abstract In the second part of this paper, we continue to review the history of AAVSO charts, including the evolution of the charts, and the challenges and accomplishments of the Chart Committee from the 1960s through 2006.

1. Introduction

This paper is a continuation of "The History of AAVSO Charts, I: The 1880s Through the 1950s" which was published in *JAAVSO* Volume 34, Number 1, 2005 (Malatesta and Scovil 2005).

2. Another undertaking

By the 1960s, the inventory of AAVSO variable star charts numbered in the hundreds. The AAVSO Chart Committee now possessed more than four decades of charting experience to draw from. Based on their history with chart revisions and expansions, the Committee knew full well that chart making was an ever-evolving process. New and improved resources always loomed on the horizon. The 1960s and beyond held no exception to this rule.

Several decades earlier, Dr. C. P. Olivier, Director of the University of Pennsylvania's Flower Observatory, resolved to "widen the scope" of the observatory's 18-inch refracting telescope. According to Olivier *et al.* (1940), "For many reasons the field of variable stars seemed most advantageous, and a small beginning was made in 1929. The first step was to obtain from Harvard College Observatory photographs of a few regions, suitable for the A.A.V.S.O. program, in which the comparison stars had been selected but the magnitude had not been determined." The variable star project, however, was not the primary interest of Olivier and his team, which, over the years, included the assistance of a myriad of graduate students. "All this has meant that variables did not have precedence, that they were observed often on nights of inferior seeing, and that the work lasted over a longer interval than was desired. Further, when so many people make estimates

or measures of the same object, there inevitably is less homogeneity in the results" (Olivier *et al.* 1940). Olivier published the data, including comparison star coordinates and magnitudes, in Olivier *et al.* 1940 and Olivier 1952, with the epochs and periods of the variables appearing in two later papers (Olivier 1958, 1959). Olivier, a former AAVSO Council Member (1930s), offered his original materials, charts, and notes to the AAVSO for plotting (Ford 1966). In 1966, avid AAVSO observer/member Clinton B. Ford (Figure 1) began turning these materials into AAVSO-format charts. Referred to as "preliminary" charts, these pencil-traced plots were subject to correction based on later observations or sequence work. The flexible nature of the preliminary chart project led to the massive expansion of charted variables in the AAVSO program, ultimately allowing the addition of hundreds of new Mira and U Gem-type variable stars—stars that "AAVSO observers should have been observing long ago" (Ford 1970).

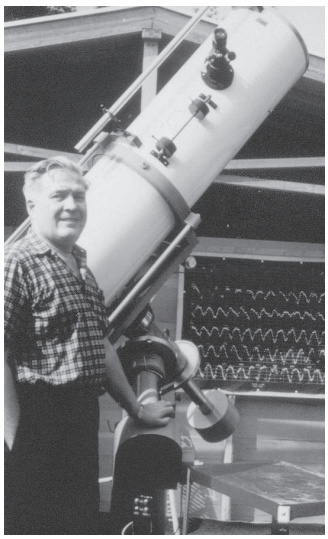

Figure 1. Clinton B. Ford began contributing observations to the AAVSO at the age of fourteen and ultimately submitted over 60,000 variable star observations to the AAVSO in his lifetime. In addition to his time as New Chart Committee Chair (1960s–1992), Ford also served as AAVSO Secretary (1948–1992) and President (1961), and received the AAVSO's Merit Award in 1961. Ford generously purchased a permanent location for AAVSO Headquarters in 1986 at 25 Birch Street, Cambridge, Massachusetts. Inauguration of the "The Clinton B. Ford Astronomical Data and Research Center" took place during the AAVSO 75th Anniversary Meeting. The AAVSO's new Headquarters at 49 Bay State Road, just a stone's throw away from the Birch Street location, bears the same name.

Assisting Ford in his work was Charles E. Scovil of Stamford Observatory (Figure 2), who photographed needed fields and measured comparison star magnitudes using the Cuffey iris plate photometer at Yale University; Wayne M. Lowder, who provided sketches of previously uncharted fields, made visual estimates of comparison stars for over 300 variables for which there was no accurate photometry, and searched published literature for the latest information, including publications in Russian—a language that he taught himself while working on the project; Dr. Arlo U. Landolt of Louisiana State University, who supplied measurements of PEP-V magnitudes; and the independent PEP-V work of Howard J. Landis of Georgia. Additional photographic assistance came from Reverend (now Monsignor) Ronald E. Royer at the Ford Observatory in California. Richard H. Stanton, Thomas A. Cragg, John E. Bortle, and Lawrence E. Hazel also contributed field and sequence information

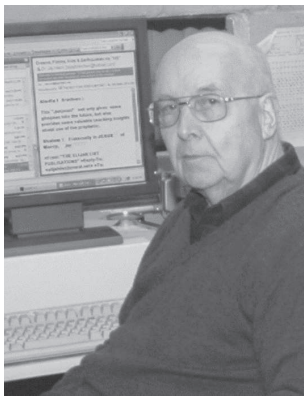

Figure 2. In addition to his chart work, variable star observations, and his New Chart Committee chairmanship (1992–2005), Charles Scovil's devotion to the AAVSO is reflected in his roles held as President (1973–1975), Associate Editor of the *Journal of the AAVSO* (1972–1978), and Co-Editor of the *AAVSO Circular*. Charles received the AAVSO's Merit Award in 1981 and the Director's Award in 1999.

in the early stages of project (Ford 1968, 1970; Scovil 1985; Stanton 1978, 1981). Additionally, dozens of other volunteers lent their charting assistance.

Ford, an investor, violinist, and astronomer, was a member of the Fairfield County Astronomical Society (FCAS) in Stamford, Connecticut, home to the Stamford Observatory. Stamford Observatory proved to be a valuable asset to the AAVSO chart-making efforts. Starting in 1967, use of the 22-inch telescope housed within the Observatory led to the production of over 1,300 plates, mostly of variable star fields. In 1976–1977 South African astronomer Christos Papadopoulos loaned the Stamford group his 24" focal-length *f*/6 Zeiss camera lens to complete the northern section of his *True Visual Magnitude Photographic Star Atlas*, from +30° to the north pole (Scovil 1996). During a two-year period, much of the remaining sky was also photographed. This collection of plates, along with those taken with the 22-inch telescope, proved to be a valuable resource for charting more new fields for the AAVSO. Further work took place at Ford Observatory, located in the mountains of southern California. The name, Ford Observatory, was in honor of Clint Ford, who furnished much of the funds to build the site. Established in the mid-1960s and situated at an altitude of 7,500 feet, the 18-inch *f*/7 telescope also aided the chart team in the photography of uncharted variable star fields (Ford 1986b).

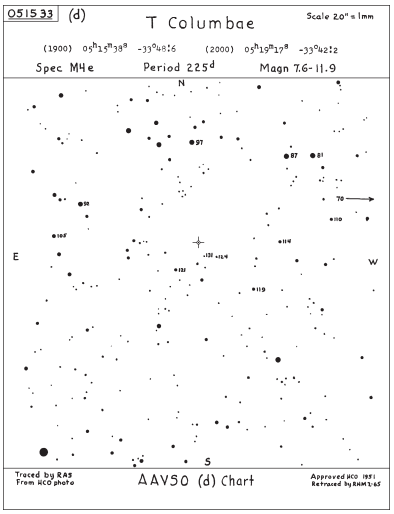

Figure 3. AAVSO "d"-scale chart for T Col. One of the 400 replacement charts re-traced by R. N. Mayall in 1965.

In 1965 an almost unimaginable event occurred. Prior to leaving for vacation that year, AAVSO Director Margaret Mayall (a former Chart Curator) placed an order with a printing company to copy about 400 of the AAVSO charts. Upon her

return, she learned that the printer had lost all of the chart masters used to make the replicated charts. Although the AAVSO sued the company for the damages, the original chart masters were gone. Fortunately, copies of the missing charts had been generated, so not all had been lost. Newton Mayall, husband of Margaret Mayall, volunteered to re-trace the charts from the copies. Newton, an architect and a draftsman by profession, was a perfect fit for the daunting task, along with many of his office personnel and colleagues who helped with the work (Mattei 2002). New tracings were produced (Figure 3), which enabled the AAVSO to continue to supply the "lost charts" to its observers. These charts remain in the AAVSO chart archives as "retraced by R. N. M. [month]-65".

3. Chart work continues

In 1968, the Olivier project was nearly complete. Of the 109 stars in Olivier's program, sixteen remained uncharted due to the lack of adequate comparison star sequence data (Ford 1968). Although the Olivier-inspired charts were winding down, the backlog of useable material for the charting of new fields was on the rise. One of these resources was the *Atlas of Finding Charts of Variable Stars* by V. P. Tsesevich and Kazanasmas (1971). Within this publication, Scovil, Ford, and Cragg found several hundred variables new to the AAVSO observing program to chart upon photography and comparison star sequence determination of each field (Ford 1974). In the words of Clint Ford (1970), "Much progress has been made, but there is clearly plenty of room for further work in the chart department!"

In the early 1970s, Clint Ford assumed the position of New Chart Committee Chair. The transferal of the Chart Committee from Hamilton to Ford is a little unclear. According to the archival lists of AAVSO Officers, Councilors, and Committee Members, the title of "Chart Committee" is absent from 1965 through 1971. Chart Committee Reports by Hamilton, however, exist from 1965 through 1970. The October 1973 General [Membership] Meeting Minutes mention a Chart Committee chaired by AAVSO Director Margaret Mayall and Clint Ford, and the 1974 annual list of AAVSO Officers, Councilors, and Committee Members shows Ford as the chair of the Chart Committee. Committee reports in the *Journal of the AAVSO* starting in 1972 show reports of "Chart Distribution" headed by AAVSO Headquarters and "New Chart Compilation" headed by Ford. The New Chart Compilation committee name was shortened to simply "New Chart." The New Chart Committee was taken over by Charles Scovil beginning with the fall 1992 report, due to Ford's illness and subsequent death in 1992. In addition, the title of Chart Curator ended with Hamilton, when in 1962 the duty of standard chart distribution was moved to AAVSO Headquarters (Hamilton 1960, 1961; Mayall 1962).

At this time, chart making and revisions were mainly in the hands of three active AAVSO members: Clint Ford was in charge of chart preparation, duplication, and preliminary chart distribution; Charles Scovil performed field photography and plate

measurements at Yale Observatory with their Cuffey iris photometer; and Wayne Lowder continued literature searches and preliminary sketches (Ford 1972a). In a letter to AAVSO Director Margaret Mayall, Clint Ford revealed the chart status: "At present, [I] have cleaned up most of the pending revisions (marked 'PRIORITY!') and am now about ready to start forging ahead with actual new charts—that is, charts for previously uncharted variables. The file of material in the later category is about 3 inches thick!" (Ford 1972b). In an effort to explain the challenge that plagued the chart makers, Clint Ford wrote the following in a letter to observer Herr Johann Bauer on January 9, 1973, most likely in response to a problem with the charts:

> You are entirely correct that errors exist (unfortunately!) on many of the AAVSO charts, both new and old ones. One must remember that the charts have been prepared over a period of about fifty (50) years by at least ten (10) different workers. Some were much more careful than others, and some were much better draftsmen than others. The job of correcting all the charts to a single standard base magnitude for comparison stars is surely a job which can never be done. The best we can do at this point, is to correct inconsistencies on each chart, and this is something we are trying to do-at least on all the new preliminary charts. In other words, we are constantly revising charts, even though it appears to be an endless task. (Ford 1973)

Beyond individual chart work, the enormous task of developing a variable star atlas began—an atlas that not only indicated the locations of the brightest variable stars, but that also identified comparison stars of known magnitude. As a trained draftsman, Scovil volunteered to make the atlas with the *Smithsonian Astrophysical Observatory Star Atlas* as a base and with financial support of Clint Ford. The immense project, which started in 1974, was anticipated to take three years to complete, but with various intervening factors, including the Papadopoulos plate project (mentioned in section 1), it took six years to produce. Covering the entire sky and showing over 2,000 variable stars with a variation exceeding 0.5 magnitude and brighter than visual magnitude 9.5 (10.5 photographic), with comparison star magnitudes marked, and with fainter variable stars in the AAVSO and the Royal Astronomical Society of New Zealand (for southern variables) shown, the resulting work titled, *The AAVSO Variable Star Atlas* (Scovil 1980) was published in 1980 by Sky Publishing Corporation of Cambridge, Massachusetts, with a second edition published by the AAVSO in 1990 (Scovil 1990). Furthermore, the *Atlas* showed the locations of hundreds of double stars. While the intent of the *Atlas* was primarily for variable star use, it also became of interest to a wide spectrum of users since it also displayed all of the Messier objects and all galaxies listed in the *Harvard Annals*, Vol. 88, No. 2 (the so-called Shapley-Ames catalogue), as well as many open and globular clusters and diffuse and planetary nebulae.

4. More categories of charts

By the mid-1980s, the preliminary chart count totaled 1,067 different scale charts for 834 "new" variable stars — stars for which no chart existed prior to the inception of the preliminary chart program nearly two decades prior (Ford 1986a). This count, however, was not a true reflection of all the new stars plotted since some of the preliminary charts received promotion to the "finalized" standard chart status. (For information on standard charts, see Paper I.) In comparison, the standard chart count was at about 1,100, which put the total tally at over 2,000 AAVSO variable star charts.

With the year 2000 approaching, AAVSO member/observer Edward A. Halbach offered to revise the collection of standard charts to include epoch 2000 positions in their chart headings. Furthermore, Scovil and Halbach worked to revise a significant portion of standard charts with additional sequence information as obtained from Scovil's *Atlas* and with updated star data from the 1985 edition of the *General Catalogue of Variable Stars* (Ford 1986a). Beyond the updates, revisions, and new field plotting, the 1980s and 90s brought about the need for several new categories of charts.

4.1. Reversed charts

With the exception of the "a" scale charts, AAVSO charts display north to the bottom and east to the right of the page for northern hemisphere variables and north to the top and east to the left of the page for far southern hemisphere variables. (For a review of AAVSO chart format, see Malatesta and Scovil (2005), Section 1). Telescopes with an odd number of reflections, however, yield a view that is the reverse of this orientation. In order better to assist the needs of the observers, member/observer Richard E. Hill began the project of reversing charts, with Edward A. Halbach continuing with the project shortly thereafter. The initial batch of eighty-five reversed standard charts was for variables in the AAVSO's list of "easy-to-observe stars," with other charts reversed as needed (Mattei 1984). Scovil began reversing the preliminary charts to add to the chart collection. Observer Marc Biesmans, who was reversing charts for his personal use, volunteered to help with the project and was quickly added to the reversed charting efforts.

4.2. PEP charts

Although AAVSO observers were making photoelectric photometry (PEP) observations as early as the 1950s, the AAVSO PEP program didn't formalize until the early 1980s. The purpose of the program was to encourage the PEP monitoring of the small amplitude red variable stars (SARVS)—stars with amplitudes much too small for accurate visual observations—as well as some RS Canum Venaticorum, Be, and yellow supergiant stars, and to obtain PEP observations to complement visual observations of stars within the visual observing program (Percy 1984). The wide-field charts for this program (between an "a" and a "b" scale chart, or an

"ab" scale with 2.4 arcmin/mm) listed numerous comparison star values, however, observers were given specific comparison and check stars to base their observations on. The values for these comparison and check stars were given to the hundredth's place, rather than to just the tenth's as visual charts had been, with the understanding that the PEP observations would be reported with more accuracy than visual. With the launch of this program, the Chart Committee released an initial batch of PEP charts that covered twenty-eight stars.

4.3. CCD charts

While CCD cameras were mainly accessible to the professional astronomical community early on, they were becoming increasingly available to small colleges and amateur observatories. These devices could reach magnitudes much fainter than the human eye and with more accuracy, and hence, became an attractive vehicle for observing fainter variable stars. Amateurs could contribute greatly since CCD-equipped observers could make many more observations than the costly professional observatories. In the words of Janet Mattei (AAVSO Director 1973–2004), "Just as photoelectric photometry has complemented the detection of small-amplitude short-term oscillations of variable stars, CCD photometry will complement our data files by providing us with fainter magnitudes of stars" (Mattei 1991).

Interest in CCD work heightened when professional astronomers working with the High Precision Parallax Collecting Satellite (HIPPARCOS) asked AAVSO CCD observers to collect four-color CCD magnitudes on as many northern HIPPARCOS variables as possible (see, for instance, Howell *et al.* 1993). Although AAVSO charts with visual and/or photoelectric *V*-magnitudes existed, *B*-, *R*-, and *I*-magnitudes were generally not available. In the autumn of 1992, Janet Mattei and colleagues Steve B. Howell of the Planetary Science Institute and Priscilla J. Benson of Wellesley College submitted a proposal to use the 0.9-m telescope at Kitt Peak National Observatory in Arizona to obtain four-color CCD comparison star magnitudes for about thirty HIPPARCOS long period variables (ultimately seventeen of these fields were observed) (Howell *et al.* 1993). The first set of CCD charts produced included six four-color charts for eight stars (Howell *et al.* 1993). Not only did these charts allow for the expansion on the fainter end of the comparison star sequence, but they also showed a smaller field of view, allowing the traditional charts scales to expand to include the "f" and "g" scales with 5 arcsec/mm and 2.5 arcsec/mm, respectively.

4.4. Constellation finder charts

In the mid-1990s, the AAVSO developed the curriculum *Hands-On Astrophysics* (HOA), a set of educational materials, activities, and investigations, based on the AAVSO's unique electronic database of variable star measurements. A set of forty-five AAVSO charts accompanied the HOA materials, with five of these being constellation finder charts. As the name implies, these charts encompass an entire constellation, with the location of bright stars and selected variables identified.

Since AAVSO observers could also use the finder charts, charting the remaining constellations led to the expansion of yet another branch of AAVSO charts.

5. The charts go electronic

Aiding in the production of the new chart categories was a process new to the chart team. In the late 1980s, the AAVSO purchased a personal computer for Stamford Observatory for the purpose of streamlining the chart making process. Computer scans of prints or negatives from various sources was the starting point of the electronic process. Since the scans resulted in star images with ragged edges, Gilbert Weingarten, member of the FCAS, wrote a computer program named ROUNDIFY to resolve the problem. The program worked in two steps: (1) a digitized star field was generated from a photo, and (2) the roundified digitized star field was then inserted into a chart template (Scovil and Leitner 1991; Weingarten 1991). The result was a chart with round objects and with diameters proportional in size to the star's magnitude. The program was equally capable of resolving multiple variable stars in a crowded region. Computer programs ultimately had a profound impact on the time spent on this phase of the charting process, reducing the work from tens of hours to less than five minutes! Once the field was generated, the chart team used an image-editing program to insert headings, footings, comparison star sequences, and so forth to complete the chart (Figure 4). (For a review of AAVSO chart parameters, see Malatesta and Scovil (2005), Section 1). The new computerized charts "led to greater efficiency and fewer errors needing correction" (Ford 1990).

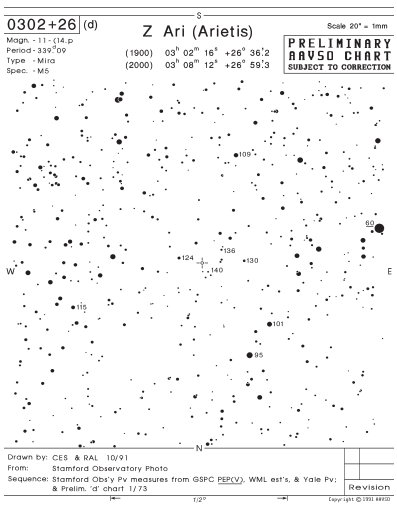

Figure 4. An early AAVSO computer-generated chart.

In the early 1990s, the chart team mainly consisted of: committee chair Clint Ford, Ron Royer, who continued with photography at Ford Observatory in California, and Charles Scovil and fellow FCAS member, Robert Leitner, who assisted Scovil at Stamford Observatory. In 1992, Charles Scovil assumed the position of New Chart Committee Chair following the illness and subsequent passing of Clint Ford on September 23, 1992. Scovil's experience with the chart work and collaboration with Ford, beginning with the inception of the preliminary chart program in the 1960s, made him the natural choice for the position. Scovil carried on with the duties of the chart committee: revising problematic charts, charting variables new to the AAVSO observing program, and converting charts to electronic form.

The AAVSO web site was the natural place to dispense the newly digitized charts, which launched in 1995. The number of charts on the web site, however, was greatly eclipsed by the number of actual charts in the AAVSO observing program.

In 1997, Director Janet Mattei headed a team of nearly a dozen AAVSO staff members, summer students, and volunteers who began work to digitize, clean, and, organize the image files for all standard charts for the Internet. The first phase of the project was completed in 1998 with the release of the electronic standard chart files. The preliminary charts followed a year later, along with the PEP, CCD, and constellation finder charts. Upon completion of the project, Mattei applied for and received a small research grant to publish the digitized charts on Compact Disc (CD). Produced in February of 2001 (AAVSO 2001), the CD encompassed over 3,500 variable star charts.

6. The new millennium

By the turn of the century, all new charts were generated by computer and made to fit the templates created by Scovil and Leitner. Several commercial planetarium programs were available that could plot star fields in whatever scale or orientation was required. This allowed other individuals the capability to begin drafting charts for use with the standard AAVSO templates. Combined with data from *USNO A2.0* (Monet *et al.* 1998) or plate scans from the Digitized Sky Survey (DSS), it was now possible to plot star fields with limiting magnitudes of 20 or fainter using off-the-shelf software.

In 2001, AAVSO staff member George Hawkins developed software at headquarters that utilized *Tycho 2* (Hog *et al.* 2000), *USNO A2.0,* and images from DSS to generate charts in this same format. The stage was now set for greater productivity in chart production, as all these tools meant charts could be drafted both at headquarters and by independent contractors off-site.

Other important pieces of the puzzle began to fit in place. More high quality, multi-color CCD photometry was now available that could be used to create sequences as faint as 18th magnitude. Hundreds of field calibrations and comparison sequences by Arne Henden and Bruce Sumner, primarily of cataclysmic variables (CV), were freely available on the Internet. In fact, many of the most prolific CV observers were already using charts utilizing these sequences in preference to the AAVSO charts and submitting observations of CVs calibrated by Henden for which the AAVSO didn't have charts. The use of non-AAVSO charts and sequences and the potential effect on the AAVSO International Database was a great concern.

In an effort to standardize the comparison star sequences used by variable star observers throughout the world, and to address the proliferation of unofficial charts, Director Janet Mattei formed the International Chart Working Group in 2000. Independent chart makers and representatives of the Royal Astronomical Society of New Zealand (RASNZ), British Astronomical Association Variable Star Section

(BAA VSS), and AAVSO were invited to take part in discussions (Toone 2005). The end result of these discussions was a uniform set of guidelines for creating new sequences and revising older existing sequences that would be used by these organizations into the future.

7. The floodgates open

In the winter of 2001–2002 Michael A. Simonsen and AAVSO staff member Aaron Price were brought on board to supplement chart production using the software at headquarters and commercial planetarium and art programs. The first results of this collaboration were ninety-eight eclipsing binary charts and forty RR Lyr star charts released in February 2002. In March 2002, 239 new charts for cataclysmic variables incorporating the new Henden/Sumner sequences were published. Some unique features of these charts were the inclusion of a table listing CCD magnitudes, colors, and errors, and the use of DSS images for the "f" scale charts.

Although a great deal of the work was still done manually, for instance, the labeling of magnitudes, coordinates, tables, and other information on the charts, computers reduced the time it took to create these customized documents dramatically. Charts for newly discovered novae and bright supernovae were now being produced within days, sometimes hours, of discovery during this period.

Scovil and Biesmans continued to produce charts throughout this period also. In August of 2002, seventy-seven new PEP charts were released and by September nearly all of the computer format charts and dozens of the older style charts were available on the website in reverse orientation. This flurry of activity culminated in October with the release of the second chart CD (AAVSO 2002), which included all these new charts.

There was still a great deal of work to be done. In June 2003, Simonsen was assigned the task of coordinating all the chart efforts for AAVSO. He organized and trained a team of volunteers (Figure 5 and Table 1) to research, draft, check,

Figure 5. The 2006 AAVSO chart team. Pictured from left to right: Richard Huziak, Jim Bedient, Roy Axelson, Mike Simonsen, Robert Stine, Chris Watson, Aaron Price, and Vance Petriew.

Table 1. AAVSO Chart Team 2003–2006.

Name	*Role*
Mike Simonsen	Team Leader
Charles Scovil	Senior Advisor
Arne Henden	Technical Advisor
Aaron Price	AAVSO Liaison
Christopher Watson	Technical Assistant
Marc Biesmans	Chart drafting
Robert Stine	Chart drafting/checking
Dan Taylor	Chart checking
Rick Huziak	Chart checking
Hazel McGee	Chart checking
Mike Armstrong	Chart checking
Bruce Sumner	Comparison star sequences
Mati Morel	Comparison star sequences

edit, and correct what would become a flood of new and revised charts published in the next years. At first, all the work was done through email correspondence, but as the volume of charts increased this proved inadequate to the task.

Another problem that had vexed the chart committee for decades was tracking and fixing the errors on existing charts that were reported by observers. Chris Watson, a computer programmer living in California, volunteered to put his skills to use and the result of his work was a web-based CHart Error Tracking tool, CHET, that went online in November of 2003. All of the previously reported chart errors were placed in the CHET database, and observers now had a reliable method of reporting new errors discovered on charts in the course of observations. This tool also provided a means for the chart team to prioritize errors to be addressed and track progress as revisions and corrections were made.

CHET served as a model for another tool used by the chart team to track the corrections and updates to the hundreds of charts in the production pipeline prior to public release. The Preliminary Error Tracking tool, PET, took the place of the hundreds of chart team emails being sent weekly regarding research, charts, sequences, corrections, and updates, much to the relief of Simonsen!

The first batch of seventy-five charts resulting from this new team effort was released September 10, 2003, followed by another 170 at the end of September and 150 new charts in December of the same year. Another 150 charts were published in January 2004, 300 in March, and the work continued at this pace up to the fall of 2005. By the time the Director's report was read at the annual meeting in the fall of 2005, the chart team had published over 2,200 new charts for the chart catalogue. A few hundred more charts made in this manner were released in 2006, but the nature of the chart making business at AAVSO was about to take another turn.

8. Back to the future

It didn't take long to realize that even this prodigious rate of chart production would eventually fall short of the needs of increasingly sophisticated observers and their equipment, who were now discovering variables, novae, and supernovae all over the sky weekly. Nor would the chart team be able to keep up with the ever-increasing pace of discovery brought on by the numerous all-sky surveys coming online each year.

Just as their predecessors of the previous century had found at each turn, the chart team knows that the job of chart production at AAVSO is going to be a never ending, continuously evolving effort. To meet the needs of the twenty-first century better, plans began to form to completely automate the chart process.

Concurrent with the work of the chart team, another group of volunteers headed by Vance Petriew worked on the huge task of documenting—recording the coordinates, magnitude, etc.—all the comparison stars and variables on all the existing AAVSO charts to create a database that will eventually be used by an automated chart plotter. The work of the chart team, the Comparison Star Database Working Group, and their eventual roles in the future of chart production are discussed in Price *et al.* (2004).

By the AAVSO's centennial in 2011, observers will be able to create their own custom charts for variable stars using powerful software whose user interface will be on the AAVSO website. To observers of the twenty-first century this interface may look like just another window to a heartless, inanimate machine, but the heart and soul of this beast will be the talents, energy, enthusiasm, and legacy of the people whose shoulders it stands on.

9. Acknowledgements

We would like to thank AAVSO staff member Michael Saladyga for his help in providing us with the archival materials necessary to put this history together. We also wish to express our gratitude to all of the chart makers, observers, and Headquarters staff, past and present, who have helped to make the AAVSO charts the high quality variable star maps that they are today.

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