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Amateur observations of variable stars: The French Association of Variable Stars Observers

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Abstract. We briefly present the history and activities of amateur and professionnal astronomers from the "Association Française des Observateurs d'Etoiles Variables" (AFOEV, the French society of variable star observers).

Keywords. Amateurs, variable stars, observations

1. Introduction

The pioneers of variable stars observations were professional astronomers such as Argelander, who claimed that observations of these stars is completely possible and easy for amateurs, even having simple equipments such as binoculars, small refractors or telescopes. Moreover, these observations can led to a full passion, an compensate the lack of professional observers, and even of instrument time available. In his *Astronomical Treatise* in 1834, John Herschel (William's son) wrote: *This is a division of usual astronomy that we do not culture enough, and this is exactly this one where science amateurs, only with good eyes or bad instruments, could have a good time using. It promises a rich harvest of discoveries, and this is a mission where professional astronomers are quite unable to participate, because their mission inside an observatory, is to observe other facts.* That is the essence of variable star observations, and it remains true today. Likewise in 1844, Argelander hailed the amateurs: *These observations can seem long and difficult on the paper, but they are easy to make... I am convinced that all of thus who try this observations during some weeks, will agree that they can not stop. I hope that these observations will not be buried in a desk but annually published....* Argelander founded 19 years later the *Astronomische Gesellschaft*, where he tried to have all of these principles adopted.

In 1882, William Pickering did the same and ensured the foundation of the *American Association of Variable Stars Observers* (AAVSO). He wrote a booklet *Plan for securing observations of the variable stars* and promised in 1901 to publish identification charts and magnitudes sequences up to 70 long period variables. In 1905 there were 309 stars listed in this programme. His Harvard collaborators Leon Campbell, Annie Cannon and some volunteers followed this appeal. From a publication by H.C. Wilson *Variable stars with small telescopes* and the action of the lawyer W.T. Olcott, the AAVSO was founded in November 1911. The *British Astronomical Association* (BAA) founded in 1890, would likewise soon have a variable star section.

2. The French Association of Variable stars Observers (AFOEV)

The AFOEV was born in Lyon in 1921 and has now its headquarters at Strasbourg Observatory. It reassembles mainly amateur astronomers who specialise in observing variable stars. These observations are entirely published and are freely available to amateur and professional astronomers for any application.

2.1. *History of the AFOEV*

Early in 1901, a young teacher from the centre of France, Antoine Brun observed and admired the wonderful nova which appeared in Perseus: GK Per. This was the beginning of his interest on variable star observations. At the same time, only a few hundreds of variable stars were known, and their phenomenology remained unclear. There were very few identification charts or sequences available. So A. Brun wrote to Harvard College observatory which sent him some documents such as the *Harvard Annals* Nos. 45 and 50. With these documents, Brun drew his *Atlas Photométrique des Constellations* which is still in use to draw the charts used by AFOEV members. In 1907 Brun sent his first observations on R And, R UMa, W Cyg to Michel Luizet –at this time the only French astronomer to work on variable stars at Lyon observatory. This was the beginning of a long collaboration. Brun was also in contact with the BAA and with the AAVSO secretary Leon Campbell in 1911. During the First World War, Brun knew the horrors of the Verdun battle-field, as many of his friends. Wounded in 1917, he was rescued at the hospital in Lyon. During his convalescence, he visited Lyon observatory and met Michel Luizet and Jean Mascart, director of the observatory, the beginnings of a close partnership with Lyon observatory. During a meeting in Lyon on April 16 1921, with S.C. Hunter, a representative of the AAVSO, Brun founded the *French Group of Variable Stars Observers*. The founders Henri Grouiller and Antoine Brun published their first observations in May 1921, but the official foundation act was published in the *Journal Officiel* only in 1927.

The association was very active by the time the WWII began. 1939 was a dramatic temporary end for all the activities by the AFOEV. Members were isolated, and when the war ended most of the active observers had disappeared. Despite efforts made by Marie

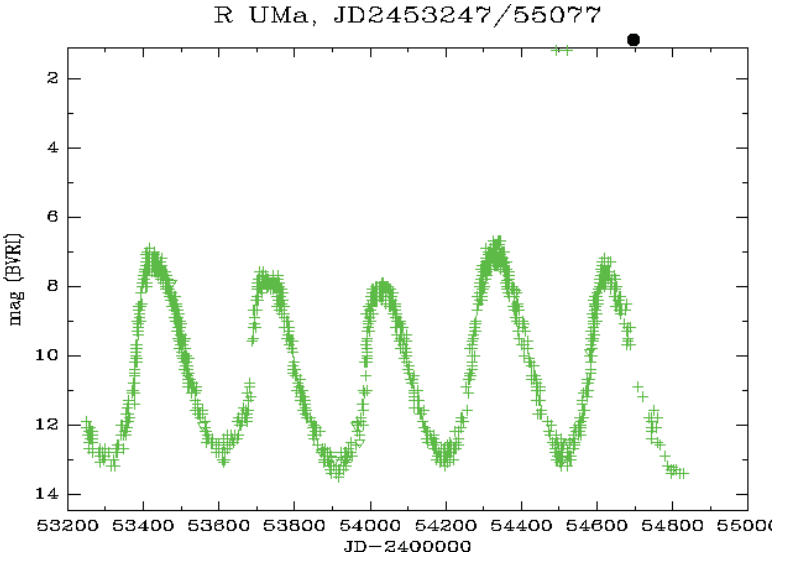

Figure 1. The light curve of the Mira star R UMa from AFOEV observations.

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Bloch, astronomer at Lyon and association treasurer, by J.H. Bigay, director of the Lyon observatory and formed pupil of Brun, then by Michel Petit, Agop Terzan, Maurice Duruy and Patrick de Saevsky the AFOEV restarted its activities only in the 1960s. In 1974 Emile Schweitzer became president. The association headquarter was based at Lyon observatory until 1921 and traditionnally its director was the AFOEV president. After 1967, the rules were modified and the headquarters moved to Strasbourg observatory on July 1st 1986. Some tentatives were made to federate European associations of variable star observers, but unfortunately without any success thus far.

2.2. *How the AFOEV is working*

The AFOEV is represented by an administration council with 9 members, where 3 are professional astronomers. In 1999, Michel Verdenet became AFOEV president, Jean Gunther general secretary, Emile Schweitzer responsible for the handling of observations. Since 2009, Laurent Vadrot and Joël Minois are in charge of the data handling. AFOEV publishes a trimestrial bulletin (BAFOEV) containing all observations, even from others countries. Among the hundreds of observers, many countries are involved: Belgium, Spain, Italy, The Nederlands, East Europe, Africa etc. Many relevant persons became AFOEV members since 1921: Ahnert, Jacchia, Kukarkin, Kopal, Parenago as well as astronomers (M. Bloch, J.H. Bigay, J. Dufay, H. Grouiller, A. Terzan, G. Jasniewicz, D. Proust, etc). Among amateur observers we can note Arturo Bernard (Portugal, who gave his name to a comet in 1923), Giuseppe Loretta (Italy, who discovered the rise of the recurrent nova RS Oph in 1933 and discovered the nova CP Lac in 1936), Maurice Duruy (who observed over more than 60 years), Paul Vedrenne (who observed over 200,000 stars and was the 5 million's estimation observer of the AAVSO), and Michel Verdenet (awarded by French Vocation Foundation, co-discoverer of comet Kohler in 1967 and of Nova V 1668 Cyg in 1978, observed more than 100,000 stars). Note that 3 asteroids are named in honour of AFOEV observers: Schweitzer, Verdenet and Proust. All these observers were friends of Antoine Brun (who died in 1978 at the age of 98) and knew him vey well. In 1921, the AFOEV programme contained only 48 stars, then in 1997, 233 observers made 120,000 observations on 1,518 stars. In its beginnings, the AFOEV observed some cepheids and algols, but now the main program focuses on long-period, irreguliar, RV Tau, RCrB, dwarf novæ, symbiotic-type stars as well as novae and supernovae. the charts and sequences used are quite similar to the AAVSO ones and all variable associations since 1945; in the past, such charts were drawn by hand by A. Brun. Original sequences were extracted from *Stellarum Variabilum Atlas* by Esch and Hagen (Vatican observatory), resulting from the photoelectric photometry from Harvard and Yerkes observatories. These sequences were updated from time to time. New sequence charts were drawn by the AAVSO using the 60 cm telescope from Stamford observatory. E. Schweitzer has redrawn all of these charts as well as new ones. Today all of them are available on the AFOEV web site thanks to D. Naillon.

All the AFOEV observations are published, formerly in the *Bulletin de l'Observatoire de Lyon* between 1921 and 1931, then in the *Bulletin de l'AFOEV* first series (BAF) until 1967 and now in the *Bulletin de l'AFOEV*, second series (BAFOEV). Observations were manually checked and listed until 1979. After 1980, results were stored using a computer by J. Gunther and E. Schweitzer with punched cards and ribbons. After January 1984, the handling of observations was made at *Centre de Données Stellaires de Strasbourg* (CDS) by E. Schweitzer. The hardest work was to collect old observations and to include them in the database.

The current database countains more than 5,000,000 observations for more than 12,000 stars from 2,931 observers. Everyone can use this database. The most observed star is

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R CrB, then SS Cyg and R Sct. The first observation was β Lyr on April 1889 at Lyon observatory by Michel Luizet. The first observation by A. Brun was U Dra on August 20, 1908. Our oldest observers still active are: E. Schweitzer (first observation of τ Ser on 1960 Aug 24), D. Proust (U UMi on 1965 May 14), P. Vedrenne (S UMa on 1967 July 12), M. Verdenet (R Vir on 1968 September 29), L. Pinatelle (S Vir on 1971 April 5), J. Minois (AN Dra on 1973 May 15) and B. Thouet (V1057 Cyg on 1973 August 8). AFOEV observations are used by professional astronomers, many of them in the context of radio-observations programmes. AFOEV participated in HIPPARCOS satellite programmes, and also in the past with IUE and IRAS satellites. Many observers now use CCDs rather than visual techniques, but the association is now offering new windows to include all new observing methods.

3. Amateur contributions to astronomy

Can amateurs still contribute usefully to the development of astronomy? Until the beginnings of the 20th century, this question did not apply and many amateurs had built or used instruments which were as powerful as the ones used by professionals, as for example William Herschel (who was a musician before he became a famous astronomer) or Pons (the janitor of Marseille observatory, who, seeing his employers examine the sky night after night, decided he would do the same and discovered 34 new comets). In the middle of the 19th century, the world's largest telescope belonged to Lord Rosse, an English nobleman, only to be superseded in 1918 when the Mount Wilson 100-inch telescope was commissioned. Nowadays, modern techniques have so much improved that it seems difficult for amateurs to contribute to the progress of astronomy. Variable stars

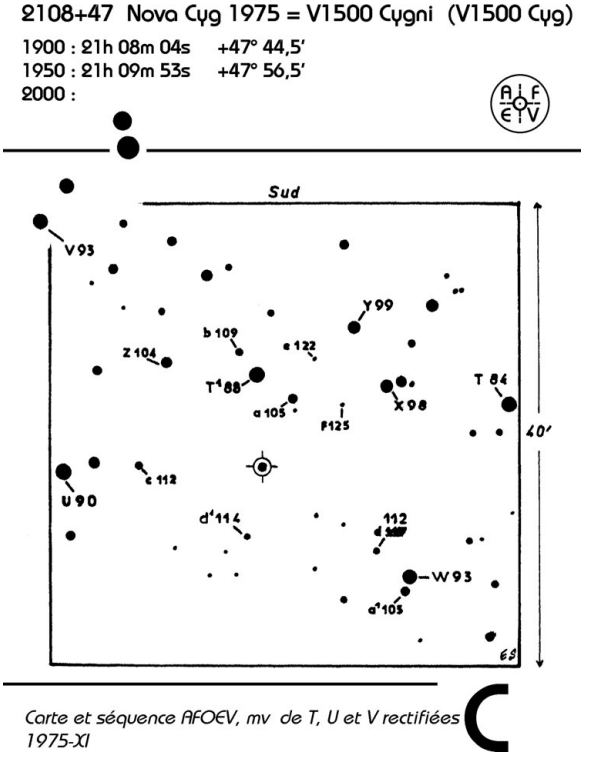

Figure 2. Identification map for the nova V1500 Cyg.

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remain however fields in which their contribution can still be very helpful. It is by using simple methods of visual photometry that American, German, British, Russian, Japanese and also French observers have made possible a better understanding of variable stars. Even the best known variable as Mira Ceti or SS Cygni (every eruption of which has been followed since 1896) must be permanently monitored because their light curves often show anomalous behaviours or unexpected features that are always related to a change of their spectra. Thus, a team of radio-astronomers at Nançay has used the observations of some Mira-type stars made by AFOEV observers to prove the existence of a correlation with a time-lag between optical and radio variations. Many novæ have been discovered by amateurs, sometimes before they had reached their maximum brightness; immediately informed, professional astronomers have thus been able to observe them by spectroscopy and the spectra obtained have allowed the nature of these objects to be better understood. Moreover, orbital telescope time allocation is limited and the contribution of amateurs has become essential to "locate" the star on its light curve at the very moment when the professional astronomers have the telescope at their disposal.

The scientific interest of the observation of variable stars is therefore not negligible and it would be shameful if observations of an amateur were kept locked in a drawer. However, publishing their own observations and making them available to professionals is obviously very difficult for an amateur. This problem finds its solution in associations which publish the observations of their members and make them available to professionals. An isolated observation, apparently of no use, becomes one of the links of a long chain forged by the whole group. Today, observations collected by the AFOEV are computer-processed and stored in digital form at the *Centre de Données Astronomiques* of Strasbourg observatory where they can be freely used by the professional and amateur astronomers of the entire world (and they don't refrain from using this possibility). The database is reachable at `http://cdsarc.u-strasbg.fr/afoev`.

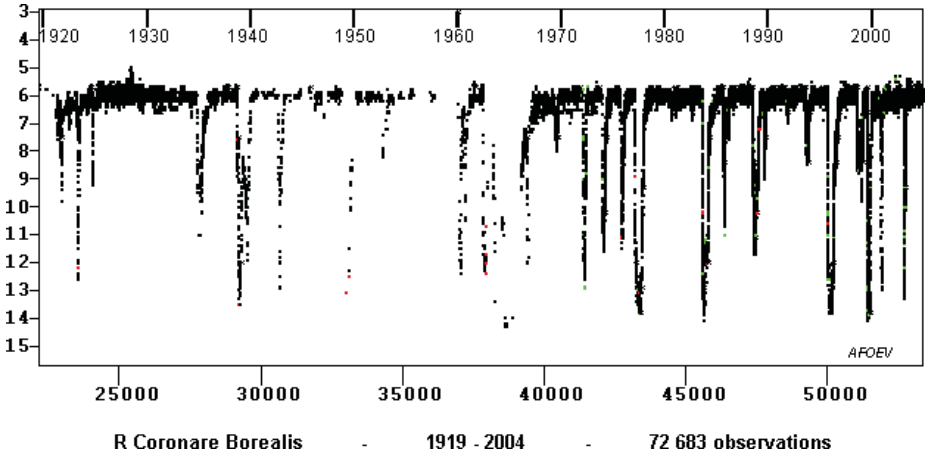

Figure 3. The light curve of R CrB from AFOEV observations.

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