PUBLISHING IS NOT ENOUGH*

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Abstract Astronomical publications are the current background for the recording of the results of our scientific work. However, frequently the individual result is hidden to the astronomical community for several reasons: the different names given to the same astronomical object, the quick change of the themes of top interest, and especially in present times, the continuously increasing amount of published articles. We give a few examples of *missing information*, and discuss the need of creating within the astronomical community a *historical memory* which must be part of the development of the human thought.

(*) Partially based on journals collected in the library of the Bologna Astronomical Observatory in Loiano.

1. The processes of transmission in time of the astronomical knowledge

During the last 200 years, the way of the transmission in time of the knowledge is deeply changed. For thousands of years the scholars basically used two mechanism: first, the research work was in practice coincident with the higher education, so that "schools" were formed where the knowledge was accumulating generation after generation, often for very long time; second, each scholar summarized his theoretical and/or experimental results in a small number of huge books. Even if *naif* and disordered, these two procedures allowed Astronomy both to preserve the memory of extraordinary phenomena, such as the explosion of supernovae (e.g. Clark & Stephenson 1977, Guidoboni et al. 1992) and to accumulate the results of positional astronomy measurements on a time scale of many centuries that brought to the discovery the equinoxes' precession (e.g. Needham 1959), and to many other developments of Astronomy. The socio-economic change associated with the industrial revolution of the 19th century deeply transformed also this part of the human life-style. In fact the birth of specialized scientific journals greatly improved the possibility of exchange of information. The following introduction of mechanisms of "scientific revision", first as comments published together with the paper and then as the modern "peer review" by anonymous referees (started in the beginning of the present century) also guaranteed the quality of the papers published on the journals. Thus, this system of trasmission of the knowledge became the most common one. At the same time, thanks to the development of a transport network more and more quick and efficient, there has been a diffusion of the scientific congress, first as an exceptional occasion of meeting of the most outstanding members of the different schools of thinking, and then as a direct discussion between a large number of representatives of the various scientific communities.
A further development happened in the second half of the present century, when the modern instrumentation and data reduction techniques brought to a quick production a huge amount of high level scientific works: we just remind that in the field of Astronomy the electronic images detectors allows the records of hundreds of high quality, highly reliable images in a single night, and that the modern data reduction software packages made the scientific results available in a few weeks, so that a modern astronomer can get in less than one month as much data as a colleague of the previous generation could have obatined in many year of hard job. The production of theoretical work too is highly accelerated by the modern computers and softwares which allow the solution of problems much more complex than that handable by analytical procedures. The last acceleration of the scientific work came from the desk-publishing packages, that allow the scholars to produce by theirselves the final form of the scientific papers, cutting out the time delay derived by the need of a technical staff (drawers, typewriters, etc.)
At the same time of the speeding-up of the scientific work procedures, in Astronomy as well as in many other scientific fields, a practical need to increase the publication of scientific papers raised up because of the current system of selection and evaluation by means of scientific output

indicators mainly based on the amount of papers published in referred journals and on the number of quotations in spite of the traditional system involving a global (and thus probably less objective) evalution of the whole scientific carreer of the candidate.

Because of these reason, the amount of published scientific matherial has been increasing exponentially in the last decades: we estimate that a middle-sized astronomical library needs to have at least 35 scientific journals (publishing on average about 1000 pages in one year), where once or more in one year some paper is published reporting data or theories largely quoted in the following years. It is self-evident that there is no scholar able to assimilate 35000 pages per year, plus *IAU Circulars*, congress proceedings, and the enormous amount of *grey literature* and of that published in related fields. Thus at the same time of the increase of the volume of the scientific literature, the *abstracts* started to diffuse, first as annual volumes, then with shorted periodicity and now as data-base retrievable *via* computer networks. We need now to ask ourselves if the current system of transmission of knowledge should be useful not only on short time scale (what is surely true) but also on mid and long time scales. In fact, Astronomy intrinsically needs to preserve the memory of the observations, since each of them is unique and not repeatable. It is thus evident that the increase of the number and quality of the observations should allow a better statistic on rare, but important, events, and the discovery of evolutionary phenomena on time scales of some centuries. The same possibility of checking the processes of validation of the current theories could be greatly improved, allowing their easier adequation to the evolution of the observational and gnoseologigic framework, which is continously evolving.

On the other hand, there is some ground which lead us to suppose that the data stored during the last two centuries in the pages of the scientific journals are in most cases unreachable and that they are known mainly by means of a few *overviews* or *surveys*, where they are presented filtered and interpreted through the knowledge and the believes of the survey author so that the original content is often lost.

2. Some cases of data lost in the journals' pages

A first example of valuable data lost in the pages of an astronomical journal is given by the light history of η Car. This star is one of the few well recognized galactic Luminous Blue Variables (LBV). Its light curve can be traced back to the beginning of the 17th century, thanks to the careful discussion of Innes (1903), which was also summarized by Gratton (1963) and by van Genderen & Thé (1984). However, we have by chance found previously unreported observations of this star made by the French astronomer A. Kulczynsky covering the period 1860-1865. Contrary to the current belief, these data suggest that the star reached the first magnitude in 1860-1862, with possible large luminosity fluctuations, followed by a steep fading in 1865. These data show that the reconstruction of the the light history of η Car published by Innes (1903) missed at least one important episode which should change in a relevant way the energetics of η *Car* during its active phase started in 1827 (Polcaro & Viotti, 1993). It is interesting to notice that the data that we have found come from *La Connaissance des Temps*, a very authoritative journal published by the French *Bureau des longitudes* since the 18th century, and reporting the ephemerides for professional use for "*astronomes et navigateurs*" (i.e. astronomers and sailors), as well as, until the end of the 19th century, a few papers of general interest written by well known astronomers. Because of this reason, this journal was very diffuse in the past century. Moreover, Kulcynsky's (1865) paper reported an extraordinary phenomenon such as the day time visibility of η Car, before of its fading to the 7th mag. However, this paper was forgotten, since *La Connaissance des Temps* stopped to publish research papers the end of the 19th century, becoming just an almanac. Thus, it was no more consulted by researchers, and what was published in this journal in the past decades went lost. We must also notice that the original Innes' (1903) discussion on the light curve of η *Car* is divided into two parts: the earlier one, up to the beginning of the 19th century, contains a detailed discussion of the sources; the second (covering a 70 years period) is considered based on observations made following modern standards and thus these observations are not discussed in details. In fact, all the measurements (but two) reported by Innes for the period 1860-1865 come from only two British observers (Tebbutt and Abbott). It is clear from his paper that Innes was acquainted with many more observations than those reported in his paper, and excluded many of them which on his opinion were not reliable enough. In most cases Innes was probably right, but we should remind that, at the time of the Innes' work (1903), there was no knowledge of any stellar object, except novae, which would undergo large luminosity variations similar to those observed in η Car. Furthermore, Innes himself mentioned that Tebbutt has later (at the end of the century) revised his observations, published many years before the Innes paper and summarizing many decades of observations. It is therefore possible that Tebbutt was convinced that some of his original measurements, maybe those showing unexpected peaks of the star brightness, were wrong, and then these observations were ruled out in the revision, in order to obtain a smoother curve, more acceptable following the framework of armony and smoothness of the astronomical phenomena, typical of the 19th century natural philosophy. Actually, the original Tebbutt's (1871) paper, clearly states that his datum related to the year 1862 is the average of 19 observations, spreaded between January and August, while for the year 1860 there are just two data points, taken at 15 days of distance, and no data are reported for the year 1861.

The second case of lost data that we wish to present is related with a peculiar object, whose existence might represent a problem for the current theories of stellar evolution: the variable star V439 Cyg. This star was first named by van Schewick (1941), who, on the base of photometric observations performed at the Bonn Observatory, found a variability between V=12.6 and 13.0, with a possible periodicity of 260 days and an indication of a "red" colour. In fact, the star is still classified as a "red variable" in the General Catalog of Variable star (Kukarkin et al. 1969). On the other hand, V439 Cyg was observed by Merril and Burwell (1949) who reported in the Mount Wilson catalogue of emission line stars a visual magnitude of 11^m and a B3e spectral type with a strong Hα emission; this classification was derived from an objective prism measurement in the range 5600-7100 Å obtained in 1944, followed in the same year by a higher resolution spectroscopic measurement performed in a band (not better defined in the paper) around Hα. In the Merril and Burwell paper, the star is called MWC 1015. However, Helene Perraud and her pupil B. Pelletier (1959) identified V439 Cyg as a carbon star of variable brightness, as a result of an objective prism study in the range 4000-4900 Å. The star was called V349 Cyg in their paper. Many years later, Turner and Forbes (1982) performed a detailed photometric study of the open cluster Berkeley 87, where the star lies, and found for this star a magnitude V=11.84, colour indices B-V=1.54, U-B=0.37 and no indication of long term time variability. On the base of these data, they classified the star as a strongly reddened young object (probably of B spectral type). This result was confirmed by English et al. (1982), who found (even if from a low resolution, low signal-to-noie ratio measurement) that the spectrum of the star is that of a peculiar emission star of B0 spectral type. However, the position of the star in the CM diagram of Berkeley 87, suggested by Turner and Forbes (1982), is not compatible with this spectral classification. We have observed V439 Cyg on August 1-7, 1986 and on September 20-24, 1986 at the 1.52 m telescope of the Bologna Observatory in Loiano. We obtained a further 40 minute exposure (S/N$\simeq$ 100) of the star in July 1987 at Roque de los Muchachos Observatory using the 2.5 m Isaac Newton telescope with the Intermediate Dispersion Spectrometer and the IPCS detector. A 30 minute CCD exposure, centered on Hα, was taken one night later with the same telescope. The resulting spectrum shows Hα and Hβ strongly in emission, Hγ and Hδ in absorption with narrow central emissions and numerous faint emission and absorption lines. Thanks to the collaboration of Dr. G. Muratorio of the Observatoire de Marseille, we have obtained the original plates of the carbon star survey made by Perraud and Pelletier (1959) at the Observatoire de Haute Provence, in order to investigate the reality of the strong difference reported in the literature on the spectra of V439 Cyg. This star was recorded on 18 Kodak IIaO plates, taken with the 40 cm OHP telescope with the Great Objective Prism spectrometer. Many of these plates were underexposed for such a faint star, and two were blurred, but two of them were perfectly exposed and driven, showing that the 1958 spectrum of V439 Cyg was definitely a late-type one (Polcaro et al. 1989). In fact, in addition to the numerous Fe I lines, the Balmer lines are deep in absorption, and the G band is clearly visible as well as other absorption features which can be identified as CN, CH, C_2 bands. We have observed again V439 Cyg in the range 4450 - 7100 Å on August 15, 1988 and found that the 1988 spectrum shows significant differences from the 1987 one. The main one is the lack of an unidentified blend at 4499-502 Å that was one of the strongest absorption features in 1987 and many of the lines identified in the 1987 spectrum appeared changed. Moreover, after dereddening our spectra with E(B-V) = 1.53 mag (Turner & Forbes 1982), it was impossible to fit the data with any reasonable value of black body temperature. Even admitting an uncertainty in the classification of the star or any reasonable value of the reddening, it is impossible to fit the spectrum with any black body temperature (Polcaro et al. 1990). It has thus been well established that V439 Cyg is a star which presents serious spectral classification problems. In fact its spectrum was undoubtedly changed in the last decades from a late to an early type. This time-scale is too short to be easily understood within the framework of current evolutionary theories, even considering the most recent ones that describe the post-red giant branch blueward evolution (e.g. Maeder, 1987). A minor spectral change occurred from 1987 to 1988. On the other hand, the change of the star's colour in a few decades is not easily related to the presence of a close cold companion, since no trace of a spectrum of another star is present in any epoch. So far, the spectral change of V439 Cyg, while confirmed without any doubt from the analysis of the 1958 plates, remains unexplained, though some hypotheses have been proposed (Polcaro et al. 1990; Polcaro et al. 1991). Apart from the explanation of the phenomenon, we want to stress that between 1958 and 1982, when the major spectral change of V439 Cyg happened, no spectra of this star were taken or, if they were, they were not published and are still hidden in some forgotten plate vaults. Surely this fact should not be happened if it was known since the beginning that V439 Cyg and MWC 1015 were the same object. Unluckly, these names were given during the 2nd World War, when the national components of the astronomical community were forced to cut all their relations. Furthermore, the Perraud and Pelletier (1959) paper was published in a French national journal, with a relatively small diffusion, and the work was not reprised in the following years, since D. Pelletier has left the scientific activity after her thesis.

3. Conclusions

The two cases that we have presented show the two main mechanisms which may originate the loss of astronomical informations in a relatively short time, even if they were published in scientific journals. In the first case, too much time elapsed between the publication of the data and their scientific utilization. In this way, from one side who collected the published data had to face with a mass of data too high to allow their accurate cross check and, on the other, the changed environmental conditions (main literature, physical models) of the astronomer who take the data and who used it did not allowed the correct interpretation of the measurements. In the second case, the datum had too a little diffusion, first because of the war and then of the little relevance given to a work that remained confined in the *grey literature*.

As said above, it is highly possible that the proliferation of the scientific literature, largely following the two episodes described in this work, will make the situation even worser unless this problem will not be quickly considered. Thus, it is urgently needed that all the astronomical community will recover his hystorical memory and feels again itself as a part of a cultural process, started thousands of years before us and to be continued for a long time.

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