

## Spis treści

<b>Robert Janusz SJ: prace</b> . . . . .	<b>2</b>
Książki . . . . .	2
Artykuły . . . . .	2
Rozdziały . . . . .	4
Redagowane . . . . .	5
Cyfrowe . . . . .	6
Konferencje . . . . .	6
Prezentacje . . . . .	7
W druku . . . . .	13
Złożone do druku . . . . .	13
Streszczenia ( <i>Abstracts</i> ) . . . . .	13
<b>Indeks osób</b> . . . . .	<b>23</b>
<b>Indeks tytułów</b> . . . . .	<b>24</b>

## Robert Janusz SJ: prace

Stan z dn. 13 czerwca 2018 r.

Streszczenia oznaczane są odślawcem *Abstract*<sup>1</sup>.

W ramach kategorii opisy są sortowane od najnowszych.

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### W druku

JANUSZ, ROBERT. „Informatyka – wirtualia czy realia? W stronę filozofii informatyki”.

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### Streszczenia (Abstracts)

1 Streszczenie.

2 Nawet gdyby nie było żadnego komputera, informatyka pełniłaby nadal typową dla siebie rolę. Dzięki informatyce możemy bowiem w ogóle zrozumieć, sformułować i rozwiązać wiele problemów; czasem robimy to także na komputerach. Metody badawcze informatyki odsłaniają nam pewne warstwy rzeczywistości, które bez niej nawet dla filozofii byłyby zakryte.

3 Interstellar extinction is investigated in a  $2^\circ \times 2^\circ$  area containing the dust and molecular clouds LDN 183 (MBM 37) and LDN 169, which are located at  $RA=15^h 54^m$ ,  $Dec=-3^\circ$ . The study is based on a photometric classification in spectral and luminosity classes of 782 stars selected from the catalogs of 1299 stars down to  $V=20\text{mag}$  observed in the Vilnius seven-color system. For control, the MK types for the 18 brightest stars with  $V$  between 8.5 and 12.8mag were determined spectroscopically. For 14 stars, located closer than 200pc, distances were calculated from trigonometric parallaxes taken from the Gaia Data Release 1. For about 70% of the observed stars, two-dimensional spectral types, interstellar extinctions  $A_V$ , and distances were determined. Using 57 stars closer than 200pc, we estimate that the front edge of the clouds begins at  $105 \pm 8\text{pc}$ . The extinction layer in the vicinities of the clouds can be about 20pc thick. In the outer parts of the clouds and between the clouds, the extinction is 0.5–2.0mag. Behind the Serpens/Libra clouds, the extinction range does not increase; this means that the dust layer at 105pc is a single extinction source.

4 The interstellar extinction is investigated in a  $1.5\text{deg}^2$  area in the direction of the open cluster M 29 (NGC 6913) in Cygnus, centered at  $RA.=20^h 24^m$ ,  $decl.=+38^\circ 30'$ . The study is based on photometric classification of 1110 stars in spectral and luminosity classes down to  $V=19\text{mag}$  using photometry in the Vilnius seven-color system published in Paper I (Milašius et al. 2013). Additionally, in the same area the extinction is investigated using 1147 red clump giants (RCGs), identified by combining selected two-color diagrams of the 2MASS and Spitzer surveys. The investigated area is divided into three

- parts with different obscuration and in these directions the extinction versus distance plots up to 5kpc are presented. In the whole area a steep rise of the extinction is observed at a distance of ca. 800pc; it should be related to dust clouds in the Great Cygnus Rift obscuring the stars behind it by  $A_V=4.0-4.7$ mag. RCGs exhibit much larger extinction values, up to  $A_{K_s}=1.2-1.3$ mag in the more transparent areas and 1.45mag in the northeastern part of the area and above it, where the dust cloud TGU H466 is located. These values of  $A_{K_s}$  correspond to  $A_V=10-12$ mag. We do not exclude the possibility that the largest values of the extinction belong not to RCGs but to some contaminating intrinsically red AGB stars penetrated through the applied RCG selection constraints. The extinction in the TGU H466 cloud probably originates in two cloud systems—the Great Cygnus Rift at 800pc and the Cygnus X complex of dust and molecular clouds at 1.3–1.5kpc.
- 5 Determining the distance to the open cluster M 29 (NGC 6913) has proven difficult, with distances determined by various authors differing by a factor of two or more. To solve this problem, we have initiated a new photometric investigation of the cluster in the Vilnius seven-color photometric system, supplementing it with available data in the  $BV$  and  $JHK_s$  photometric systems and spectra of the nine brightest stars of spectral classes O and B. Photometric spectral classes and luminosities of 260 stars in a  $15' \times 15'$  area down to  $V=19$ mag are used to investigate the interstellar extinction run with distance and to estimate the distance of the Great Cygnus Rift, ca. 800pc. The interstellar reddening law in the optical and near-infrared regions is found to be close to normal, with the ratio of extinction to color excess  $R_{B-V}=2.87$ . The extinction  $A_V$  of cluster members is between 2.5 and 3.8mag, with a mean value of 2.97mag, or  $E_{B-V}=1.03$ . The average distance of eight stars of spectral types O9–B2 is  $1.54 \pm 0.15$ kpc. Two stars from the seven brightest stars are field stars: HDE 229238 is a background B0.5 supergiant and HD 194378 is a foreground F star. In the intrinsic color-magnitude diagram, seven fainter stars of spectral classes B3–B8 are identified as possible members of the cluster. The 15 selected members of the cluster of spectral classes O9–B8 plotted on the  $\log L/L_\odot$  versus  $\log T_{\text{eff}}$  diagram, together with the isochrones from the Padova database, give the age of the cluster as  $5 \pm 1$ Myr.
- 6 Magnitudes and color indices in the Vilnius seven-color system were determined for 1752 stars down to  $V=19.5$ mag in the direction of the open cluster M 29 (NGC 6913). The region is centered at RA=20:24, DEC=+38:30(J2000) and covers an area of 1.5sq.deg. The photometric data are used to classify about 70% of stars in spectral and luminosity classes and peculiarity types.
- 7 The results of CCD photometry in the Vilnius seven-color system down to  $V=18$ mag are presented for 242 stars in the direction of the young open cluster IC 1805 that is located in the active star-forming region W4 in the Cas OB6 association. Photometric data were used to classify stars into spectral and luminosity classes, and to determine their interstellar reddenings, extinctions and distances. We confirm the  $CH_3OH$  and  $H_2O$  maser VLBA parallax results that the cluster is located close to the front side of the Perseus arm, at a distance about 2.0kpc. In the color-magnitude diagram, zero-age main sequence (ZAMS) stars of the cluster extend to spectral class A0. The extinction values for the majority of the cluster stars are between 2.2 and 2.7mag, with a mean value of 2.46mag. This extinction originates mainly between the Sun and the outer edge of the Local arm, in accordance with the distribution of CO clouds. In the Perseus arm and beyond, the extinction was investigated using the classification and reddening determination for A0–F0 stars measured in the  $r, i, H_\alpha$  system of the IPHAS survey to  $r=19$ mag. The extinction  $A_V$  within the Perseus arm ranges from 2.5–4.5mag at the front edge to 3.0–5.0mag at the far edge. Possibly, we have found about 20 early A-type stars located in the Outer arm. The 2MASS  $JHK_s$  photometry for red giants gives much higher extinction values (up to about 6mag), which would correspond to the stars located behind dense clouds of both arms. In the area, using the WISE, 2MASS, and IPHAS photometry data, 18 possible young stellar objects (YSOs) of low masses are identified. Six high-mass YSOs (five Ae/Be stars and a F6e star) are known from previous investigations.
- 8 Fr. Roberto Busa was an Italian Jesuit. In this article his biography will briefly be presented, and some issues raised by his philosophy analyzed. Busa was known as a pioneer of computerized research in the humanities. With the support of IBM he constructed the Index Thomisticus, containing all the works of St. Thomas Aquinas. He believed that expressions of the human can be mathematically modeled. He was the originator of a specific conception of hypertext, in which logically structured programs are able to challenge the general linguistic mode of thinking, in order to make better communication and understanding possible. However, Busa was also conscious of the general ethical problems involved (Babel), and he hoped that the basic logic of objects could progress towards the truth of being.
- 9 We have performed multicolor CCD observations of the central area of NGC 752 to search for faint, low-mass members of this open cluster. Four  $12' \times 12'$  fields were taken on the 1.8m Vatican Advanced Technology Telescope (Mt. Graham, Arizona) using a 4K CCD camera and eight intermediate-band filters of the Strömvil (Strömgren + Vilnius) system. In this paper we present a catalog of photometry for 405 stars down to the limiting magnitude  $V=18.5$ , which contains  $V$  magnitudes and color indices of the Vilnius system, together with photometric determinations of spectral types, absolute magnitudes  $M(V)$ , interstellar reddening values  $E(Y - V)$  and metallicity parameters [Fe/H]. The good quality multicolor data made it possible to identify the locus of the lower main sequence to four magnitudes beyond the previous (photographic) limit. A relatively small number of photometric members identified at faint magnitudes seems to be indicative of actual dissolution of the cluster from the low-mass end.

- 10 One can speak about mathematics too simplistically. On the one hand, school programs are such examples. On the other hand, the function of mathematics in elementary physics very much indicates the profound philosophical significance of mathematics: the author claims that mathematical language is a kind of command language, i.e. it is not just a description, but a control which has a specific power (lat. *virtus*) to manage the reality. This language has its proper hierarchy and structures which humans only are just starting to understand and to use in basic ways, not without errors. Therefore, some ethics regarding human mathematical thinking are needed: the affirmation of life.
- 11 W artykule jest omówiona rola matematyki w fizyce z filozoficznego punktu widzenia. Naukowa praktyka fizyków często wyznacza matematyce jednowymiarową rolę narzędzia: czy to przy opracowaniu danych empirycznych, czy też w poszukiwaniu rozwiązań równań matematycznych. Z metodologicznego punktu widzenia rola matematyki w fizyce jest o wiele głębsza; matematyka stanowi hierarchiczny system, bez którego w ogóle niemożliwa byłaby fizyka współczesna. W końcu fizyka otwarta jest na możliwość dobra filozoficznego. In the article the role of mathematics in physics is considered from a philosophical point of view. The scientific practice of physicists often designates mathematics to play one-dimensional role of a tool: either for empirical data processing or for solving theoretical problems. But from a methodological point of view the role of mathematics in physics is much deeper; mathematics constitutes a hierarchical system without which the modern physics in general would be impossible. To conclude, physics is open to the possibility of philosophical good.
- 12 In the article the emergence of notions: energy and entropy is studied. New physical discoveries were interesting for the domain of natural theology as well. The evolution of the notions in physics makes sometimes too simplistic expectations for philosophy of scientists. As an example Ostwalds' energetism is given, where even ethics had its energetic imperative. On the other hand Fourier's type of philosophical elements in science is shown where fundamental role of mathematics is presupposed.
- 13 The role of virtual methods in object oriented programming is presented. The object oriented approach could be extended to the philosophical domain of rational thinking and virtual methods can be used as a link between scientific and philosophical domains.
- 14 In the domain of astronomy the object oriented paradigm of informatics needs to construct an ontology to be able to reason about concepts and construct queries in a computerized knowledge system. The article presents the approaches to ontology in philosophy, natural sciences and informatics and shows their limits and reciprocity.
- 15 A method for organized and automated reduction of CCD photometric observations of stars is described. The Command-Phot software, based on this method, extends the CommandLog used for processing CCD frames from the VATT telescope (Mt. Graham, Arizona). The CommandPhot with macros is available on a personal request.
- 16 Phenomenological concepts describing electromagnetic interactions were expressed mathematically by Maxwell in his theory of electromagnetic field. His work was not free of mechanistic influences. It also broke down some elements of inductionistic paradigme. Maxwell's theory cannot be reduced to a simple methodology of solving equations. Physical theories imply a deeper understanding of equations which carry an 'immaterial content'. The 'higher symmetries' hidden in the equations should to use Einstein's expressions be viewed as a 'stuff of the Universe'.
- 17 The second Law of Newton's dynamics could be regarded as a research program: by investigating momentum change, one is able to obtain simple formulae for expressing the physical force. However, such a program is unrealistic because of the problem with defining the concept of inertial system. Einstein has solved this problem in his general theory of relativity. In this theory, Gravity is not a force but rather the geometry of the world. It does not act at a distance, but determines local motions of masses. Einstein's research program consisted in a bold hypothesis in the field of mathematical physics rather than in any mathematization of observational results.
- 18 The article is about an interaction between philosophy and informatics. The discussion is based on a complex example—a country, which has an evolving domain. In contemporary computer science very complex systems are modeled. However, it would be impossible to model such systems with every detail, because it would be too difficult, it would be as complex as the reality itself. Frequently complex domains dont have an exact description of their behavior: some have an inadequate description, some have a contradictory one. To model such complex domains a computer science specialist acts like a philosopher: makes classifications, explanations, etc. On the other hand there have to be some philosophical presuppositions—a conviction that a logical analysis and design will work in the domain being modeled: a postulate is introduced that logos is able to capture-in the reality. The descriptions are continuously purified from irrational influences. Informatics is the science of information, of processes, it is about the discrete world. With its algorithmic method it is possible to model a complex reality such as a country. But as was mentioned above, some kind of abstraction is necessary to construct the vocabulary for the objects and processes in the domain. There could be a temptation to use the model of

a country as a model for the whole world. The question is whether it would work. There are a lot of different concepts of “globalism”—tendencies to construct a government to govern the whole world. But the concepts are in conflict and some social communities vary so much that it is difficult to find a common solution. On the other hand the social problems within a country have a tendency to evolve and change. In Informatics, there is a paradigm to model a real domain on the basis of “data abstraction”. In this approach the constant and variable entities, as well as all operations of an interaction have to be found on the basis of abstraction. The article contains a short analysis of philosophical abstraction to point out what it means to abstract; the generalization can not destroy the identity of an object, but it must look for the best ways to work on the very brought domain. Three levels of Aristotelian abstraction are discussed—physical, mathematical and metaphysical. The tendency to all “abstraction” something that destroys the object is defined as a non-abstraction activity. It is obvious that informatics should use only real abstractions. But the data abstraction paradigm has its difficulties—it prefers non-evolving domains, for example, things that we know well and are unchanging. The model of a country is therefore difficult to describe. If there was such a system—it would be in continuous refinement of the reality would have to be kept constant to fit a system. Everyone knows that these two possibilities really do exist in the societies. Mathematical abstraction has its equivalent relation on a set (reflexive, symmetric and transitive). Thank to this very precise relation, the structure of a set can be generalized. An example of “being a member of a family” is given as a real structure in a social group. If in a social group there was no such relation, this group would not be able to be generalized until such change occurred. This means that some social groups would have difficulties to enter into relations with countries, which have their own types of relations. On the basis of this analysis we can see, that a single “super country” is not possible in the present situation of mankind. Another paradigm in informatics is called „object paradigm”. It can describe two separated sets, which recall a common “meta” structure and methods. This paradigm looks for prototypes, protosystems, rather than for a modeled object. This paradigm does not prefer a model country but a basic “community”. Polymorphic methods—typical in this object paradigm—could use the same name to describe operations related to object structures. The object paradigm would than be able to describe mankind as a system of countries in continuous evolution and would be free of difficulties associated with data abstraction due to a common “meta” structure.

- 19 The importance of determining the error of the flat field in CCD photometry is detailed and our methods of doing this are described. We now have reached a precision of 1–1.5% in our photometry. Color-magnitude diagrams of the open cluster M 67 (ours and Laugalys et al. 2003) are compared.
- 20 We briefly describe a method of organizing all the star field exposures taken in a complete CCD observational run. By a „CommandLog” (to be published in *J. Astron. Data*) one can organize all the observations and process them within IRAF in an orderly, automated manner to arrive at stellar photometry calibrated into a standard photometric system (in our case, Strömvil). During the course of this processing we determine the error of the flat and try to correct it.
- 21 We live in the times of a computer revolution and our culture is torn between humanistic and scientific mentalities. This creates a challenge for modern education: How to use modern technology in the process of education and not disturb vulnerable psychological structure of children?
- 22 We introduce stellar photometry, its purpose and relationship to other astronomical quantities, presenting it within the context of astronomical research at the Vatican Observatory. We demonstrate the usefulness of the Vilnius Photometric System previously shown at Vilnius Astronomical Obs., Edinburgh Royal Obs., and Università di Roma ‘La Sapienza’, and then adopted by the Vatican Observatory for use with its Vatican Advanced Technology Telescope (VATT) on Mount Graham, AZ, USA. The development of astronomical observations has led from photographic plates, through photoelectric detectors to the use of sensitive CCD cameras. Expanding the photoelectric databank of ‘Vilnius Stars’, we describe the development of new techniques of data-acquisition, calibration to photometric standards, stellar classification and interstellar-matter characterization. Looking ahead, we briefly describe the extensive data set, and our plans for further detailed analyses.
- 23 The ontological reductionism is partially concerned in the text. The main ontological question is the affirmation of God. But many scientists and humanists stopped to talk about the Creator. In the missing place the stones (lat. calculi) for calculus proclaim with mathematical language the laws which transcend human mind. The object oriented languages tell us that missing an essential links in the information system leads to collapse of the whole endeavor. It could happened with science and philosophy if they forget about the reality of man, Universe and the Creator.
- 24 The article demonstrates the anthropological space of information based on the digital word. Thanks to the works of G. Boole and A. Turing, modern computers were constructed as the von Neumann architecture. The influence of computers on our culture is evident, however, it also creates a deep ethical problem. The evolution of our reason by means of informatics shows us our limits, discovered by K. Gödel. Thus our separation from the Absolute is evident, but the methods to reach the new, unknown truth, are always open. To deal with the ethical problems pertaining to a human



life we need to apply different anthropological insights to informatics. The best way to do it is the way through Christ's Humanity. However, because not everyone accepts it, other disciplines can serve as signposts.

- 25 In science we naturally (in material and rational ways) encounter the works of God, given to us in the goodness of creation. This is not only a religious statement but a philosophical one as well. Within the context of science we help each other to experience God's Love. A human being is capable of living in God's truth and love, because he is created in God's image, revealed in the Logos, Christ. Within the context of science ethical responsibility is required as well. Despite the potential wrong usage of science, we can search and live in harmony between scientific and ethical consequences. The teaching of Pope St. John Paul II gave us important directions not to lose sight of in what is essential in this process.
- 26 We obtained CCD observations of the open cluster NGC 752 with the 1.8m Vatican Advanced Technology Telescope (Mt. Graham, Arizona) with a 4K CCD camera and eight intermediate-band filters of the Strömvil (Strömgren + Vilnius) system. Four 12'x12' fields were observed, covering the central part of the cluster. The good-quality multicolor data made it possible to obtain precise estimates of distance moduli, metallicity and foreground reddening for individual stars down to the limiting magnitude,  $V=17.5$ , enabling photometric identification of faint cluster members. The new observations provide an extension of the lower main sequence to three magnitudes beyond the previous (photographic) limit. A relatively small number of photometric members identified at fainter magnitudes seems to be indicative of actual dissolution of the cluster from the low-mass end.
- 27 We describe our methods to correct the initial flatfields by removing detected systematic dependency of the stellar magnitudes on their location in the CCD frames. Assuming flatfields are made with exposures on a unit input light source and that no added scattered light arrives in the focal plane, then such flatfields should be fine for calibrating the exposures on star fields. But at VATT (and probably most telescopes) the two assumptions of unit input and of absence of scattered light, are not strictly valid. And so the photometry is compromised unless correct flatfields are found.
- 28 The multicolor observations in eight intermediate-band filters of the Strömvil (Strömgren + Vilnius) system were obtained during two separate runs, on the nights 2007 November 2–8 (run „SQ”) and six nights between 2008 October 28 and November 5 (run „SU”), using a 4K CCD camera on the 1.8m VATT telescope on Mt. Graham, Arizona.
- 29 The observational material was obtained with CCD cameras on three different telescopes: the wide-field Maksutov-type 35/51cm telescope of the Molėtai Observatory in Lithuania (2004), the 1m Ritchey telescope at the Flagstaff Station of the US Naval Observatory in Arizona (2006–2008) and the 1.8m VATT telescope of the Vatican Observatory on Mt. Graham, Arizona (2011–2012).
- 30 Table 1 contains the results of photometry of 242 stars down to  $V=18$ mag in the Vilnius seven-color system in the direction of a young open cluster IC 1805. Photometric data are used to classify stars in spectral and luminosity classes. The identification numbers, coordinates,  $V$  magnitudes and six color indices in the Vilnius system, photometric spectral types and membership estimates are given. VSA are numbers from Vasilevskis et al. (1965AJ.....70..806V), and MJD are numbers from Massey et al. (1995, Cat. J/ApJ/454/151). The coordinates are from the PPMXL catalog (Roeser et al., 2010AJ....139.2440R, Cat. I/317).
- 31 The CommandLog contains a comprehensive method for extracting precise stellar photometry from CCD frames. It has been prepared mainly for the Vatican Advanced Technology Telescope data frames. An IRAF package of tasks (CL and PERL scripts) is given and some easy to process data frames included as an example. The use of text tables allows organizing the frames and preparing them for automatic processing. The CommandLog contains an HTML document which facilitates following carefully detailed instructions and examining data frames. Pasting source CL code from an HTML window to the IRAF CL allows estimating and controlling all necessary IRAF parameters. Adaptation to other data sets should be easy enough provided one adheres to software conventions of IRAF, TTABLES, and PERL.
- 32 On September 29, 1935, Pope Pius XI officially inaugurated the new headquarters of the Specola Vaticana in the Papal Palace of Castel Gandolfo. With new telescopes, a new spectra laboratory, and a young staff of Jesuit scientists, this inauguration marked the beginning of an intense period of scientific achievements at the Vatican Observatory. Now, eighty years later, the members of the current Vatican Observatory are joining with our adjunct scholars to celebrate this anniversary with an internal symposium that explores the scientific and cultural work being undertaken at the Observatory today.
- 33 The molecular cloud MBM 37 and the corresponding dust cloud LDN 183 belong to a group of high-latitude clouds near the Serpens Caput and Libra border at  $b=+36$ deg. We determined the distance to this cloud applying the extinction  $A_V$  vs. distance diagram based on two-dimensional photometric classification of about 800 stars down to  $V=15$ mag and about

- 200 stars down to  $V=19$ mag observed in the Vilnius seven-color system. Additionally, for the stars brighter than  $V=12$ mag MK types were determined spectroscopically. Distances for part of them, located nearer than 500pc, were calculated from the Gaia parallaxes. The distance to MBM 37 is found to be at 90pc placing it among the dust and molecular clouds closest to the Sun.
- 34 The results of a new investigation of interstellar extinction in the direction of the emission nebulae Sh2-231 and Sh2-235 are presented. The investigation is based on CCD photometry and photometric MK classification in seven areas of 12' by 12' size in the Vilnius seven-color photometric system down to  $V=19$ mag. Additionally, for the same task we applied 519 red clump giants identified in the surrounding 1.5deg. by 1.5deg. area using the results of photometry in the 2MASS and WISE surveys. The dependence of the extinction run with distance allows determining distances to dust clouds and their extinctions. We compare these new more detailed results with the preliminary results described in our previous paper (V. Straizys et al. 2010, *Baltic Astronomy*, 19, 169) and the AAS communication at the AAS Meeting No. 219 (Austin), 349.12. The relation of the TGU H1192 dust cloud with the Auriga OB1 association is discussed.
- 35 Stellar photometry in the Vilnius Photometric System requires one percent quality for deriving luminosity class and spectral type subclass. We use such existing photometry of the open cluster M 67 to calibrate new CCD observations at the Vatican Advanced Technology Telescope (VATT) for correcting the flat-fielding zero-point and deriving the color-transformation in this intermediate-band, seven filter system (Boyle et al., *BAAS* 37 4, 2005). Recently we have developed a 'tie-in' observational practice to apply the zero-point and color transformation of the M 67 observations to neighboring starfields of interest that have no existing photometry. Sky transparency must remain constant to better than one percent during a round of short exposures in a filter between the field having calibrated photometry and the new field having no photometry as if the new field was exposed simultaneously with the master field. Proof of success for this 'tie-in' method is shown with the master field being M 67 and the 'tie-in' field being the nearby extended 'corona' area. The distinctive color-magnitude diagrams of the old open cluster M 67 reveal the sensitivity to having constant sky transparency during the round of short exposures on M 67 and its extended area. For the extended area has the same form in its color-magnitude diagram as M 67. So variation in sky transparency shows displacement on the color-magnitude diagrams at the one percent quality. We will attempt new analysis concerning evolution of this very old open cluster (2.56Gyr, WEBDA, <http://www.univie.ac.at/webda/>) and the surrounding 'coronal' extent with reference to previous work by Chupina and Vereshchagin (*Astron. Astrophys.*, 334, 552, 1998).
- 36 A few years ago Drew et al. (*MNRAS*, 386, 1761, 2008) in the vicinity of the Cyg OB2 association have found hundreds of A0-A5 stars, applying the three-color IPHAS photometric system. The estimated distances to these early A-stars are close to the distance of Cyg OB2. If they belong to the association, this means that the star forming process in the association is non-coeval. To verify the reddenings, spectral types, distances and ages of the discovered A-type stars, we have started their investigation in the Vilnius seven-color system which gives MK classification and reddening determination of stars of all spectral types. Therefore, together with the supposed early A-stars, we will classify hundreds of stars down to  $V=18$ mag or fainter, and this will allow us to estimate distances to the Great Cygnus Rift and to the Cygnus X star forming region. In the poster we will present the preliminary results of photometry and classification of stars in three 13x13arcmin areas close to the center of Cyg OB2.
- 37 Informatyka jest nauką dynamicznie rozwijającą się. Jej oddziaływanie — tak zewnętrzne, jak i wewnątrz społeczności informatyków — można określić na trzech poziomach: mitotwórcze, światopoglądowe oraz filozoficzne. Istnieją informatycy, których działalność przejawia poważne problemy moralne. Informatyka określa także dzisiejsze „społeczeństwo informacyjne”, którego światopogląd opiera się na bazach wiedzy bez podmiotu poznającego, realizujących Popperowską wizję „trzeciego świata” niszczonego od czasu do czasu przez wirusy tworzone przez mitycznie nastawionych informatyków. Informatyka oddziałuje także filozoficznie np. wtedy, gdy jej wytwory, przetwarzające szybko tylko zera i jedyńki, porządkują nasz zagmatwany świat zmysłów i myśli, skracając nasz dystans i czas na drodze dochodzenia do prawdy, do wartości osobowych, do większego dobra i sensu.
- 38 The results of CCD photometry in the Vilnius seven-color system down to  $V=17$ mag are presented for about 150 stars in the direction of a young open cluster IC 1805 located in the active star forming region W4 in the association Cas OB6. Photometric data are used to classify stars in spectral and luminosity classes, and to determine their interstellar reddenings, extinctions and distances. We confirm the maser VLBA parallax results that the cluster is located on the front side of the Perseus arm at a distance close to 2.0kpc. The extinction values for the cluster stars are between 2.3 and 3.6mag, with the mean value 2.6mag. This extinction mainly originates between the Sun and the outer edge of the Local arm, in accordance with the distribution of CO clouds. The extinction in the Perseus arm and beyond is investigated using the classification and reddening determination for A0-F0 stars measured in the  $r, i, H_\alpha$  system of the IPHAS survey down to  $r=19$ mag. The extinction within the Perseus arm ranges between 2.5-4.5mag at the front edge to 3.0-5.0mag at the far edge. The 2MASS JHKs photometry for red giants gives much larger values of the extinction (up to about 6 mag) which should correspond to the stars located behind dense clouds of the Perseus arm. In the area, using the WISE, 2MASS and IPHAS photometry data, 24 possible young stellar objects (YSOs) are identified.

- 39 The HII region Sh2–231 is thought to belong to the Auriga OB1 association, together with other emission nebulae, Sh2–232, Sh2–233 and Sh2–235, all within 1 square degree. The area is surrounded by a giant molecular cloud G173.7+02.7 also known as a dust cloud LDN 1525 or TGU 1192. Distances estimated from the exciting stars of the HII regions are known with low accuracy (between 1.0 and 2.3kpc). Most authors consider that all listed HII regions are related to the association Aur OB1: the mean distance of its stars is 1.3kpc. In our earlier paper (Straižys et al., *Baltic Astronomy*, 19, 169, 2010) we argued the Sh2–231 nebula might not be related to the association. More probably this nebula is in the Perseus arm seen semi-transparently through the dust cloud TGU 1192. We investigate the 12' by 12' area using the VATT telescope with a 4K CCD camera and seven filters of the Vilnius photometric system to determine spectral and luminosity classes, interstellar reddenings, extinctions and distances for the field stars down to  $V=17$ mag. Thus we learn the distance to the dust cloud and its relation to the nebula Sh2–231. IPHAS and MegaCam photometry provides spectral types for fainter stars. Both Vilnius and IPHAS photometric data are in agreement that the dust cloud in the direction of Sh2–231 begins at a distance of about 1.3kpc, i.e., it is undoubtedly related to the Aur OB1 association. The extinction  $A_V$  in the cloud ranges between 1.5 and 4.5mag. However, the star ALS 8476 (O9V,  $V=10.79$ ,  $A_V=3.6$ ,  $d=2.3$ kpc) is too far to be related to the Aur OB1 star-forming region. Consequently, if this star is the exciting source of Sh2–231, the nebula belongs to the Perseus arm.
- 40 Głównym problemem większych systemów informatycznych jest “odgadnięcie” obiektowej ontologii, która “pasuje” do ujęcia danego problemu. Niepoprawna ontologia (np. pominięcie fundamentalnych obiektów czy relacji) prowadzi do szybkiego kolapsu systemu informatycznego. Podobnie jest z jakąś niepoprawną teorią fizyczną czy filozoficzną. Jednakże “odgadnięcie” właściwej ontologii w jakiejś nietrywialnej dziedzinie informatycznej jest niejako czystym problemem filozoficznym. Języki obiektowe pozwalają ująć znacznie więcej niż jedynie kompilowalny kod maszynowy. Można nimi teoretycznie opisać np. filozoficzne zagadnienia typu metafizycznego. Dzięki temu języki te mają większą racjonalną otwartość niż Turingowskie programy. Nasz unikatowy obiekt – Wszechświat nie jest mechaniczną, jednowymiarową taśmą. Wszechświat ma wpisaną w siebie informację – swój głębszy, racjonalny program, którego skrawki możemy odkrywać w naszych matematycznych i etycznych obiektach.
- 41 A region of active star formation is located in the complex of dust and molecular clouds known as the Pelican Nebula and the dark cloud L935. In this paper we describe the results of our investigation in the area bounded by the coordinates (2000) RA 20h50m – 20h54m and DEC +44d20m – 44m55d. Our CCD photometry in the Vilnius seven-color system, obtained on the 1.8m Vatican Advanced Technology Telescope, Mt. Graham, and the 1m telescope of the USNO Flagstaff Station, is used to classify stars down to  $V=17$ mag in spectral and luminosity classes. The interstellar extinction values and distances to these stars are determined. Additionally, the data from the 2MASS, MegaCam, IPHAS and Spitzer surveys are analyzed. We present star population maps in the foreground and background of the complex and within it. The known and newly identified YSOs in the area are tabulated.
- 42 The North America and Pelican Nebulae, and specifically the dark cloud L935 contain regions of active star formation (Herbig, G. H. 1958, *ApJ*, 128, 259). Previously we reported on Vatican Telescope observations by Strömvil intermediate-band filters in a 12arcmin field in the ‘Gulf of Mexico’ region of L935. There we classify A, F, and G-type stars. However, the many faint K and M-type dwarf stars remain somewhat ambiguous in calibration and classification. But attaining reasonable progress, we turn to another part of L935 located near the Pelican head. This area includes the ‘bright rim’ which is formed by dust and gas condensed by the light pressure of an unseen O-type star hidden behind the dense dark cloud. Straižys and Laugalys (2008 *Baltic Astronomy*, 17, 143) have identified this star to be one of the 2MASS objects with  $A_V=2.3$ mag. A few concentrations of faint stars,  $V$  13 to 14mag are immersed in this dark region. Among these stars are a few known emission-line objects (T-Tauri or post T-Tauri stars). A half degree nearby are some photometric Vilnius standards we use to calibrate our new field. We call on 2MASS data for correlative information. Also the Strömvil photometry offers candidate stars for spectral observations. The aim of this study in the Vilnius and Strömvil photometric systems is to classify stars down to  $V=18$ mag, to confirm the existence of the young star clusters, and to determine the distance of the cloud covering the suspected hidden ionizing star.
- 43 Within the program of photometric and spectral investigation of stars in the vicinity of the North America and Pelican nebulae, we have determined two-dimensional photometric spectral types of 40 faint stars (down to  $V=18$ mag) in an area of 12x12arcmin size in the direction of the dense dust cloud known as Gulf of Mexico (a part of the larger cloud L935). The frames were exposed in eight medium-band filters of the Vilnius and Strömgren systems with the 1.8 meter VATT telescope. Most of the stars are K and M dwarfs located either in front of or inside the dark cloud at a distance of about 550pc. Two of the stars are known Orion-type variables, and some more are suspected to be H $\alpha$  emission stars. For confirmation of their YSO origin spectroscopic observations are planned.
- 44 Philip and Boyle have been making Strömgren and then Strömvil photometric observations of open and globular clusters at the Vatican Advanced Technology Telescope located on Mt. Graham in Arizona. Our aim is to obtain CCD photometric indices good to 0.01 magnitude. Indices of this quality can later be analyzed to yield estimates of temperature, luminosity and metallicity. But we have found that the CCD chip does not yield photometry of this quality without further

- corrections. Our most observed cluster is the open cluster, M 67. This cluster is also very well observed in the literature. We took the best published values and created a set of 'standard' stars for our field. Taking our CCD results we could calculate deltas, as a function of position on the chip, which we then applied to all the CCD frames that we obtained. With this procedure we were able to obtain the precision of 0.01 magnitudes in all the fields that we observed. When we started we were able to use the 'A' two-inch square Strömgren four-color set from KPNO. Later the Vatican Observatory bought a set of 3.48inch square Strömgren filters, The Vatican Observatory had a set of circular Vilnius filters There was also an X filter. These eight filters made our Strömvil set.
- 45 We observed the globular cluster M 3 in the 7-band Strömvil system plus Vilnius X-band at the 1.8m Vatican Advanced Technology Telescope with a 2K CCD giving a 6arcmin field. We observed the open cluster M 67 in the same run. Here from the residuals of many stars fit to quality CCD Vilnius photometry (Laugalys et al., 2004, *Baltic Astronomy*, 13, 1) we reshape and thus correct the initial flatfields. M 67 with a wide color base gives the color transformations of the run by calibrating from about 12 photoelectric standards in the Strömvil and similar Vilnius systems. In M 3 six photoelectric standards of moderate quality, all red stars of 13th magnitude in the Vilnius system calibrate the zero-point magnitude scale. Point-spread-function fitting to the stars in the crowded M 3 field resolves blends. With relatively short exposures of minutes a limiting magnitude  $V=15$  is obtained with a signal/noise ratio about 100. So from this new photometry we subsequently can classify all types of stars and treat questions of reddening, distances, membership and metallicity at least at the horizontal branch of the cluster.
- 46 In August/September 2006, after the IAU meetings in Prague, a group of us met for two weeks at the Molėtai Observatory, in Lithuania. Attending the meeting were the three authors, Olga Pintado from Argentina and the Lithuanian group, headed by Vytas Straizys. We started the meeting with a series of papers given by each member of the group. The first papers dealt with the creation of the Strömvil System, the next papers concerned the reduction of data and the calibration of the system. The final paper session reviewed the CommandLog, written by Janusz and Boyle. The CommandLog allows one to paint IRAF commands into the IRAF window and this ensures that all members of our group will reduce the photometric data in exactly the same way. For the rest of the meeting the group used the CommandLog to reduce photometric data. The Lithuanian group had not used this method up to now so Janusz and Boyle instructed them on the use of the CommandLog. CCD data from the Maksutov telescope at Molėtai was reduced and gave good results. Janusz, Philip and Pintado worked on CCD data obtained on the 2.15M telescope at Casleo in July. They confirmed earlier reductions made at Castel Gandolfo last year that the white spot on the dome gave flat frames that needed no corrections.
- 47 How obtain in the Strömvil system CCD photometry of one percent quality needed for subsequent stellar classification in temperature, surface gravity, reddening and metallicity? At the Vatican 1.8m telescope on Mt. Graham we always observe M 67 as a standard field. Laugalys et al. (*Baltic Astronomy*, 13, 1, 2004) demonstrate the quality of their CCD photometry in M 67 as free of flatfielding error in the published CCD photometry in the Vilnius system. The Strömvil and Vilnius photometric systems are linearly transformable. We now find that we can use that CCD photometry as standards to show and correct for any systematic error of the initial flat used for our observations. We fit instrumental magnitudes per filter as dependent on the CCD standards not only with zero-point and color term but also with terms in  $x, y$  over the field. We then extract an illumination correction from these  $x, y$  fitted terms and thereby make a corrected flat. Use of the corrected flat shows any systematic error of the initial flat has vanished. Consequently we can use with confidence this corrected flat on new object fields where only a few standards are needed for fixing the zero-point for the color transformation.
- 48 The Vatican Advanced Technology Telescope on Mt. Graham is being used in a program of CCD photometry of open and globular clusters. We are using the Strömvil System (Straizys et al. 1996), a combination of the Strömgren and Vilnius Systems. This system allows stars to be classified as to temperature, surface gravity, metallicity and reddening from the photometric measures alone. However, to make accurate estimates of the stellar parameters the photometry should be accurate to 1 or 1.5 percent. In our initial runs on the VATT we did not achieve this accuracy. The problem turned out to be scattered light in the telescope and this has now been reduced so we can do accurate photometry. Boyle has written a routine in IRAF which allows us to correct the flats for any differences. We take rotated frames and also frames which are offset in position by one third of a frame, east-west and north-south. Measures of the offset stars give us the corrections that need to be made to the flat. Robert Janusz has written a program, the CommandLog, which allows us to paste IRAF commands in the correct order to reduce measures made on a given observing run. There is an automatic version where one can test various parameters and get a set of solutions. Now we have a set of Strömvil frames in the open cluster, M 67 and we compare our color-magnitude diagram with those of BATC (Fan et al. 1996) and Vilnius (Boyle et al. 1998). A preliminary report of the M 67 photometry will be found in Laugalys et al. (2004). Here we report on a selected set of stars in the M 67 frames, those with errors 1 percent or less.
- 49 On June 9–11, 2004 CCD frames were taken of the globular cluster NGC 6793 with the 2.15m telescope at CASLEO in Argentina by Philip and Pintado. In a previous paper we reported on a preliminary determination of the error of the flat.

In August this year Philip, Janusz and Boyle worked together at the Vatican Observatory, Castel Gandolfo and made a more complete analysis of the  $y$ ,  $b$  and  $v$  flats. The flat frames are obtained by taking exposures of an illuminated white spot, attached to the dome. To test how flat the spot exposures are central frames are taken through each filter and then the telescope is moved north and south and then east and west and four more sets of exposures are taken. A data base is built up where we have the magnitudes of stars as they appear at different positions on the CCD frame. The differences between these sets of magnitudes are calculated and mapped as a function of where they appear on the chip. Plots of these differences, as a function of the  $x$  and  $y$  coordinates on the chip, are made. The ideal result is a graph showing a scatter of 1% about a rms error=0. If a gradient of any kind is found in the plots then an equation can be found to correct the trends found. There were about a dozen standard stars [We used Graham and Doremus 1968, AJ 73, 226.] well spaced over the frame. We excluded any stars that were close to the edge of the frame. Frames that had poor seeing introduced false tilts so they were not used. The star in common in the pairs of frames had to have similar intensities on each frame. Then, remembering that the photometric differences increase as the magnitudes go fainter all the fainter stars were removed from the calculations. In the preliminary report we found that for the North and East frames the scatter was a bit higher and there were gradients of up to 2%. But now, after rejecting inferior frames, we find that the scatter is 1% across the entire frame for each of the  $y$ ,  $b$  and  $v$  frames. We were able to construct a color-magnitude diagram for the stars that had photometric errors of 1% or less. A well-defined horizontal branch is seen as well as the asymptotic giant branch and five blue stragglers. The main sequence can be seen to a  $y$  mag of 15. Stars fainter than this limit had rms errors greater than 1%.

- 50 Classification of stars by color is important in stellar studies because from it we are able to attain essential information about stars like: temperature, composition, age and mass; from these we can also derive its history, and future evolution. This classification can be done by photometry or spectroscopy. Photometry provides information from more stars in a given field of view, magnitude and approximate size. The Strömvil photometric system, developed by V. Straižys (Vilnius Observatory, Lithuania), allows more precise photometry using 7 filters, ranging from 330–700nm. Since the color of a star is associated with the wavelength of the electromagnetic radiation of light emitted by it, each filter allows only certain wavelengths to go through into the CCD camera; then, each neighboring wavelength band can be compared against the others and the color relationship can be converted to magnitude. Our Milky Way galaxy has billions of stars, of which we only have information from a small set. We obtained images of the NGC 6811 and NGC 6819 Open clusters, and the M 56 Globular cluster at the Vatican Advanced Technology Telescope in Mt. Graham, AZ. During an 8 night observing run, images were taken in each filter with 3 different pointings overlapping by 2arcmin. Calibration by known standards from A. Kazlauskas (e.i. Baltic Astronomy, Vol. II) that fall in the observed regions will be done. From this photometry other star information; such as luminosity, distance, metallicity, surface gravity, and spectral class will be determined.
- 51 We have been making CCD observations on stellar fields with use of the Strömvil and Vilnius Photometric Systems at VATT, Mt. Graham; Casleo; USNO-Flagstaff, and Loiano, Italy. From quality photometry of one to two percent accuracy the classification of all the types of stars can be made. We will present our application of the CommandLog (Janusz and Boyle, 2003, The Journal of Astronomical Data, 9, 4) and then show methods for iterating the processing by use of the SIMPLEX algorithm. The CommandLog is an HTML document that provides the photometry cookbook steps to be pasted into the IRAF command line. SIMPLEX code incorporated into our IRAF task allows quick reprocessing of the data to minimize the errors of the flatfield or tune IRAF photometric parameters in order to obtain the optimum stellar photometry both in the instrumental and transformed standard systems. In July 2004, a Strömvil workshop was held at Castel Gandolfo, Italy. Philip was able to work with the creator of the CommandLog, Janusz, on some CCD data obtained at CASLEO with Olga Pintado. Using SIMPLEX it was possible to investigate many different variations of the input parameters to use in reducing the data. Without SIMPLEX this process would have taken many days of work but we were able to do a set of variations in a few hours.
- 52 On June 9–11, 2004 CCD frames were taken on the 2.15m telescope at CASLEO in Argentina by Philip and Pintado. One of our main concerns was detecting the error of the flat in each of the filters used during the observing run. The good news is that for most of the chip it seems that the  $y$  and  $b$  flats can be used without any correction. There may be a small correction to be made to the north and east.
- 53 Calibrating CCD stellar fields to derive precise, one percent, photometry requires corresponding validity in the assumption of unit input sent through the telescope optical system for making the initial flat. Twilight or nighttime sky or even dome light might make the initial flat. Scattered light can compromise the applicability of the flat for quality photometry. Test exposures on a rich star field can provide data to reveal the error of the flat, and also may be used to correct the initial flat. We have developed automated methods for tuning the initial flat so as to confidently apply the corrected flat to other stellar fields having just single exposures in an observing run.
- 54 W potocznym obrazie działania komputerów migające światelka kontrolne i naciskanie guzików sprawia wrażenie, że dzięki temu komputery potrafią wykonać fantastyczne rzeczy. W refleksji nad przyczynami tych trywialnych uproszczeń

zostanie pokazane, że poza binarnym stanem lampek i klawiszy drzeźnią olbrzymie przestrzenie logicznych i fizycznych modeli złożonych systemów informatycznych. Innymi słowy: dlaczego i jakiej filozofii poszukuje informatyka aby radzić sobie ze złożonością.

55 We have been working on a program of setting up standards in the Strömvil photometric system and have been doing CCD photometry of globular and open clusters. A previous paper (Boyle et al. BAAS, AAS Meeting 193, 68.08) described the results of observations made in the open cluster M 67, which we are setting up as one of the prime standard fields for Strömvil photometry. Now we discuss our observations of M 37, made on the Vatican Advanced Technology Telescope on Mt. Graham, Arizona. One of us (R.J.) has automated the data processing by a novel method. The Strömvil group is multinational. By use of this innovative automated, yet interactive processing method, one systematically applies the same processing steps to run in IRAF by capturing them as presented in html files and submitting them to the IRAF command language. Use of the mouse avoids errors and accelerates the processing from raw data frames to calibrated photometry. From several G2V stars in M 67 we have calculated their mean color indices and compare them to stars in M 37 to identify candidate G2V stars there. Identifying such stars relates to the search for terrestrial exoplanets. Ultimately we will use the calibrated Strömvil indices to make photometric determinations of  $\log g$  and  $T_{\text{eff}}$ .

## Indeks osób

- [Editors], 11  
[Redakcja], 11  
[Redaktorzy], 11  
[Vatican Observatory], 8–10
- Andersson, B.-G., 2, 7
- Bartašiūtė, S., 3, 4, 6  
Bieś, A. P., 12  
Boyle, R., 2, 11  
Boyle, R. P., 2–12  
Bremer, J., 5, 6, 11  
Brożek, B., 4
- Černis, K., 2, 6
- Corbally, C., 2  
Corbally, C. J., 7
- Dańkowski, D., 4  
Darowski, R., 5  
Davis, A. G., 11  
DeGrijs, R., 4  
Deveikis, V., 4  
De Sitter, W., 7  
Duchliński, P., 4  
Dybeł, K., 4
- Einstein, A., 7
- Grzywacz, R., 4
- Heller, M., 5  
Homa, T., 4
- Janusz, R., 2–13  
Jonkisz, A., 9
- Kazlauskas, A., 2, 3, 6, 7, 9, 11, 12  
Krauze, F., 5
- Laugalys, V., 2, 3, 6, 8, 9, 11, 12
- Lepine, J. R. D., 4  
Lisiak, B., 6
- Macijauskas, M., 2  
Maskoliūnas, M., 2, 7  
Mączka, J., 4–6  
Milašius, K., 2, 6  
Munari, U., 2, 7
- Olszewski, A., 5
- Philip, A. G. D., 3, 4, 6, 9–12  
Pintado, O. I., 11, 12  
Podrez, E., 4  
Polak, P., 5  
Popiel, J., 13  
Poznański, J., 6
- Senderecka, M., 6  
Smilgys, R., 2, 6  
Sterken, C., 5  
Stott, J., 9, 10  
Straižys, V., 2, 6–10  
Szczercińska-Polak, M., 5  
Szymczyk, M., 4
- Ślipko, T., 10
- Urbańczyk, P., 4
- Vrba, F. J., 2, 6, 9, 10
- Walborn, N. R., 2  
Woleński, J., 5  
Wszolek, S., 5, 11
- Zambrano, L. F., 11  
Zarębianka, Z., 4  
Zdanavičius, J., 2, 6, 7  
Zdanavičius, K., 2, 6, 7

## Indeks tytułów

- [Informacje o działalności], 8–10  
'Nowe języki' w Obserwatorium Watykańskim, 10  
[Od redaktorów], 11  
[recenzja], 9–12  
[Szkoła fotometrii], 7  
[Średniowieczna] Kosmologia 'magnetyczna', 9  
80th Anniversary of Specola Vaticana in Castel Gandolfo, 6
- Abstrakcja, obiekty i cywilizacja globalna, 3  
Analytical Flatfield Corrections on VATT Data, 5  
Analytical Flat Field Correction on the Vatican Advanced Technology Telescope. Photometry Data, 11  
Analytical Flat Field Correction with Big Offsets of Frames, 11  
Antykoncepcja a życie, 10  
Asteroida 296968 Ignatianum, 9  
Automation and Iteration Methods for Processing CCD Stellar Photometry in the Strömvil System, 11  
A Photometric Observing Program at the VATT: Setting Up a Calibration Field, 10
- Badania astronomiczne w Obserwatorium Watykańskim, 12  
Bibliografia Tadeusza Ślipko, 10  
Bóg – Człowiek – Nauka, 4
- CCD Flatfielding for Strömvil Photometry in M 67, 11  
CCD Flatfield Correction by Differential Stellar Photometry: Automated Methods, 12  
CCD Strömvil Photometry of M37, 12  
CDS/ISIS. Procedury dostępu do zbioru głównego w języku C, 3  
Church's Thesis after 70 Years, 5  
Color-magnitude Diagrams for the Stellar Open Cluster M 67 in the Vilnius Photometric System, 8  
Color of the Stars: Oh Be A Fine Girl, Kiss Me, 11  
Cosmological Evolution. Interdisciplinary International Conference at Ignatianum, 6  
Co historia mechanicyzmu może wnieść do dyskusji o początku życia?, 4  
Co pojęcie entropii wniosło do filozofii?, 3  
Człowiek i Wszechświat. Wschód – Zachód – Południe, 6  
Człowiek: Twór Wszechświata – Twórca nauki, 7  
Człowiek : twór Wszechświata - twórca nauki, 5  
Czym jest przekraczanie progu nadziei?, 6  
Czy matematyka wniosła coś do poznania pola elektromagnetycznego, 9  
Czy nauka współczesna daje nadzieję?, 4  
Czy oprogramowanie jest proste czy złożone?, 12



- Czy Pan Jezus jest filozofem?, 2  
Czy prawda naukowa jest absolutna?, 12  
Czy siła grawitacji działa na odległość?, 3
- Deep Photometry and Classification of Stars in the Gulf of Mexico, 10  
Deep Seven-color Photometry and Classification of Stars in the Cyg OB2 Association, 8  
Deep Strömvil Photometry for Star Formation in the Head of the Pelican Nebula, 10  
Distance to the High-Latitude Molecular Cloud MBM 37 (LDN 183), 7  
Dlaczego informatyka poszukuje filozofii?, 3  
Dyskusja o In Vitro, 10
- EJS: III Conference of the European Jesuits in Science, 7  
EJS: IV Conference of the European Jesuits in Science, 7  
EJS: IX Conference of the European Jesuits in Science, 7  
Elementy mechaniki kwantowej dla filozofów, 5  
Elementy przyrodnicze w pierwszym okresie filozofii greckiej, 13  
Esiste un programma per l'Universo?, 10  
Etyka obiektywna a informatyka, 4
- Fides et Ratio, 6  
Filozofia elektryczności i magnetyzmu w starożytnym stylu, 13  
Filozofia natury w kontekście fotometrii gwiazd, 7  
Filozofia obiektowa: nauka – informatyka – etyka, 8  
Filozofia, prawdopodobieństwo i komputery, 5  
First Workshop on the Controversial Relationships between Science and Philosophy. A Critical Assessment, 7  
Flatfielding Errors in Strömvil CCD Photometry, 3  
Flat Field Time Variations on VATT, 10  
Fotometria Systemu Wileńskiego w Obserwatorium Watykańskim, 8
- Grant „Nauka-Religia”, 8
- High-latitude dust clouds LDN 183 and LDN 169: distances and extinctions, 2  
Homo Informaticus 3.0, 6
- Informatyczny świat a filozofia, 6  
Informatyka dla naukowca, 8  
Informatyka – wirtualia czy realia? W stronę filozofii informatyki, 8, 13  
Internetowy serwis Wyższej Szkoły Filozoficzno-Pedagogicznej „Ignatianum”, 12  
Interstellar Extinction in the Direction of the Open Cluster M 29, 2
- Jedna Prawda, Dwie Księgi. Nauki przyrodnicze a teologia w Ośrodku Badań Interdyscyplinarnych  
Papieskiej Akademii Teologicznej w Krakowie, 5  
JesPhil, 6  
Jezuici i przemijająca cywilizacja atlantycka, 13  
Jubileusz Ks. Prof. dr. hab. T. Ślipko SJ, 7
- Komputerowa poczta elektroniczna w krakowskim Kolegium, 13  
Komputeryzacja bibliotek, 12  
Komputery a antropologia słowa cyfrowego, 4  
Komputery – szczęście czy nieszczęście człowieka?, 8  
Konferencja w Wilnie, 12

- Kosmos i mikrokosmos, 8  
Kraków – Dom Pisarzy, 9
- Małe, dobre Obserwatorium Watykańskie. Bardzo długie odkrywanie tajemnic nieba, 11  
Matematyka, fizyka i filozofia, 3  
Matematyka, umysł, świat i dobro, 4  
Mechanika kwantowa a mechanika ‘filozoficzna’?, 9  
Miejsce nauki w systemacie Bolesława Gaweckiego, 5  
Mit, światopogląd czy filozofia informatyki?, 8  
Moc sterowania matematycznego, 3  
Molėtai Meeting on CCD Strömvil Photometry, 11  
Multicolor CCD Photometry of the Open Cluster NGC 752, 4
- Nauka i teologia nad jeziorem Albano, 12  
Nauka i wiara – naturalne i nadprzyrodzone, 4  
Nauka w poszukiwaniu filozofii, 7  
Nauka – wiara, 7  
Nauka – Wiara – Katecheza. Jak mówić o relacjach nauka-wiara w katechezie?, 6, 7  
Na naukowej ścieżce, 8
- Obliczalność a istnienie świata, 10  
Obserwacja w astronomii, 5  
Obserwatorium Watykańskie: Nauka i wiara, 9  
Obserwatorium Watykańskie: Nauka – Wiara, 9  
Obserwatorium Watykańskie – nauka i Kościół, 10  
Od redakcji, 9  
Okno na kosmos [Obserwatorium Watykańskie], 10  
One Percent Strömvil Photometry in M 67, 11  
O względności bezwładności, 7  
Ontologie informatyczne, 4  
Ontology in Astronomy, 3  
Optimizing by Means of Spectral Classification, 9  
O bazowych obiektach elektrodynamiki klasycznej, 5  
O metodach wirtualnych w paradygmacie obiektowym, 3  
O perspektywach i mitach publikowania w Internecie; Komunikat o badaniach astronomicznych  
Obserwatorium Watykańskiego w Castel Gandolfo, 12  
O ‘zagrożeniach komputerowych’ dla pedagogów, 3
- Paradygmaty w naukach o człowieku, 6  
Paradygmat obiektowo zorientowany w oprogramowaniu astronomicznym, 13  
Paradygmat obiektowy w oprogramowaniu astronomicznym, 8  
Philosophia Rationis Magistra Vitae, 5, 6  
Platon – nauka – ontologia, 4  
Poczta elektroniczna EARN, 13  
Prehistoria komputera, 3  
Preliminary Reductions for y and b CCD Flats at CASLEO, 12  
Problem człowieczeństwa ludzkiego zarodka a nowoczesne techniki zapłodnienia i selekcji  
embrionów, 7  
Program dla Wszechświata. Filozoficzne aspekty języków obiektowych, 2  
Program dla Wszechświata – filozoficzne znaczenie języków obiektowych, 9  
Przewrót kopernikański w dziejach nauki i cywilizacji, 3

- Relacja etyczno-psychologiczna w ujęciu obiektywnym, 5  
Roberto Busa i humanistyczna informatyka, 2  
Roberto Busa SJ i jego hiperteksty, 9  
Rocznik Filozoficzny Ignatianum na platformie Open Journal System, 8  
Rok Astronomii w Kościele, 10  
Rola matematyki w powstawaniu teorii pola J. C. Maxwella, 3  
Rozważania kosmologiczne na temat ogólnej teorii względności, 7
- Seminarii a Rocca di Papa della Specola Vaticana, 6  
Seven-color Photometry and Classification of Stars in the Direction of Open Cluster M 29 (NGC 6913) in Cygnus, 2  
Sieć komputerowa Kolegium-WAM zintegrowana z Internetem, 12  
Stellar Photometry: Past, Present and Future, 7  
Strömrgren CCD Observations of NGC 6397, 11  
Strömvil CCD Photometry in Globular Cluster M 3, 10  
Struktura informacji w bazach bibliotecznych, 12  
Struktura i emergencja, 7  
Stulecie kosmologicznych prac Einsteina i de Sittera, 2  
Summary, 11  
Symposium Kopernikańskie, 7  
Systemy komputerowe w bibliotekach jezuickich w Krakowie, 13
- Światło w astronomii i pomiary czasu, 8
- Tajemnice Kosmosu, 9  
Tajemnice Kosmosu: kolory gwiazd, 7  
Tajemnice Kosmosu. Planetoida Ignatianum, 8  
Teleskop Watykański i kolory gwiazd (Tajemnice Kosmosu), 8  
The 26th General Assembly of the International Astronomical Union, 7  
The Center for Interdisciplinary Studies in Cracow, 11  
The CommandLog, 6  
The CommandPhot, an Organized and Automated Method for Processing CCD Stellar Observations, 3  
The Dust Cloud TGU H1192 (LDN 1525) in Auriga. II, 7  
The Emission Nebula Sh2-231 and its Relation to the Dust Cloud TGU 1192 (LDN 1525), 9  
The Enigma of the Open Cluster M29 (NGC 6913) Solved, 2  
The Future of Photometric, Spectrophotometric and Polarimetric Standardization, 7  
The Global Method of the StrömVil Photometry Analysis. The Cloud Repositories. The Vatican Observatory Photometry Runner, 8  
The Open Cluster IC 1805 and its Vicinity: Investigation of Stars in the Vilnius, IPHAS, 2MASS, and WISE Systems, 2  
The Open Cluster IC 1805 in the Perseus Arm: Distance, Extinction and YSOs, 9  
The Pelican Nebula and its Vicinity: a New Look at Stellar Population in the Cloud and around It, 9  
The Reduction of CCD Images for Stellar Photometry on the VATT, 3  
The Vilnius Aperture Photometry of the Auriga Constellation, 8  
The Vilnius Photometric System – Studying Stars and Interstellar Matter at the Vatican Observatory, 4  
Towarzystwo Naukowe Księża Jezuitów w Krakowie. Prace 1950–2008, 5  
Twoje komputerowe bezpieczeństwo, 12

Umysł-ciało jeszcze raz, 12

Vilnius Multicolor CCD Photometry of the Open Cluster NGC 752, 3

VizieR Online Data Catalog: NGC 752 Vilnius photometry (Bartašiūtė+, 2011), 6

VizieR Online Data Catalog: Vilnius photometry of IC 1805 stars (Straižys+, 2013), 6

VizieR Online Data Catalog: Vilnius photometry of M 29 (NGC 6913) (Milašius+, 2013), 6

Warsztaty na Gregorianie, 11

Wilhelma Ostwalda poglądy na naukę i religię, 4, 10

Władysław Heinrich, Teoria poznania. Tekst – komentarze, 6

Wpływ pola elektromagnetycznego na filozofię przyrody, 9

Wprowadzenie, 10, 11

Wprowadzenie do publikacji z obrad konferencji: 'Człowiek i Wszechświat. Wschód, Zachód, Południe, 9

Wydział Filozoficzny Towarzystwa Jezusowego w Krakowie: historia – sylwetki – działalność, 11

Wyszukiwanie koniunkcji terminów w rodzinie wzorców przy użyciu języka PHP, 3

Wyzwania racjonalności. Księdzu Michałowi Hellerowi współpracownicy i uczniowie, 5

Zasady etyczne i naukowe prawa, 4

Zero Point and Spectral Class, 9

Życ etycznie – żyć etyką. Prace dedykowane Ks. Prof. Tadeuszowi Ślipko SJ z okazji 90-lecia urodzin, 5