

초기 비용을 투자하여 활용성이 높은 한문 문장 자동 번역 기라는 연구 인프라를 확보하는 첫 적용 학문 분야이다. 향후 이를 활용한 고전문 분야 학술 활동이 더욱 활발해질 것을 기대해 볼 수 있다.

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**[구 HE-06] Miller-Urey Experiments: Spectroscopy of spark discharge**

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1953년에 밀러와 유리는 초기 지구 대기와 해양을 모사하여 단순한 기체 조합으로부터 유기분자를 얻었다. 생명의 기원을 논할 때 언급되는 밀러유리 실험을 교육 현장에서 활용하고 현대적으로 해석하고자 2014년에 Parker 등에 의해 재조명되어 단순화된 장치로 실험실을 설계하여 전기방전 실험을 진행하였다. 실험장치에 사용한 유리구는 산, 염기로 각각 세척하고 200도씨 오븐에 건조하였다. 300ml 의 물을 반응 플라스크에 넣고, 83mmHg (11kPa) 압력의 진공상태에서 암모니아 100mmHg, 메탄 200mmHg, 질소 100mmHg를 주입하였다. 총 16일의 실험 기간중 66시간 방전을 하였다. 전기 방전 색이 하늘색에서 보라색으로 바뀌는 것을 확인하고 분광스펙트럼을 얻었으며, 시간에 따른 대기조성의 변화를 해석하고자 한다. 이 실험은 교내 창의연구활동 (R&E와 졸업개인연구) 의 하나로 2015년부터 학생 주도적으로 진행되고 있다.

**항성 및 항성계**

**[구 SA-01] Parameterizing the Perturbed Rotational Velocities of Planet-induced Gaps**

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Recent submillimeter observations of ALMA reveal that many protoplanetary disks contain substructures like gaps or rings. The disk-planet

interaction is believed to be the most likely gap formation scenario, and most previous numerical work attempted to constrain the planet mass using the density profiles of gas in the gaps. Since the dust and gas distributions likely differ from each other in protoplanetary disks, however, perturbed rotational velocities that directly probe the gas would give a more reliable estimate to the planet mass. In this work, we run two-dimensional hydrodynamic simulations to measure the amplitudes and widths of rotational velocity perturbations induced by planets with different mass. We present the parametric relations of the gap widths and depths as functions of the planet mass and disk properties. We also apply our relations to HD 163296 to infer the masses of embedded planets.

**[박 SA-02] A detailed analysis of nearby young stellar moving groups**

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Nearby young moving groups (NYMGs hereafter) are gravitationally unbound loose young stellar associations located within 100 pc of the Sun. Since NYMGs are crucial laboratories for studying low-mass stars and planets, intensive searches for NYMG members have been performed. For identification of NYMG members, various strategies and methods have been applied. As a result, the reliability of the members in terms of membership is not uniform, which means that a careful membership re-assessment is required. In this study, I developed a NYMG membership probability calculation tool based on Bayesian inference (Bayesian Assessment of Moving Groups: BAMG). For the development of the BAMG tool, I constructed ellipsoidal models for nine NYMGs via iterative and self-consistent processes. Using BAMG, memberships of claimed members in the literature (N~2000) were evaluated, and 35 per cent of members were confirmed as bona fide members of NYMGs. Based on the deficiency of low-mass members appeared in mass function using these bona fide members, low mass members from Gaia DR2 are identified. About 2000 new M dwarf and brown dwarf candidate members were identified. Memberships of ~70 members with RV from Gaia were confirmed, and the additional ~20 members were confirmed via spectroscopic observation. Not relying on previous knowledge about the existence of nine NYMGs, unsupervised machine learning analyses were applied to NYMG members. K-means and Agglomerative Clustering algorithms result in similar trends of grouping. As a result, six previously known groups (TWA, beta-Pic, Carina,

Argus, AB Doradus, and Volans-Carina) were rediscovered. Three the other known groups are recognized as well; however, they are combined into two new separate groups (ThOr+Columba and TucHor+Columba).

### [구 SA-03] Absolute Dimensions And Period Changes Of The Semi-Detached Algol Type Binary XZ Canis Minoris

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The first high-resolution spectroscopic and new multiband photometric observations of the semi-detached Algol type binary XZ CMi were performed at the Bohyunsan Optical Astronomy Observatory (BOAO) and the Sobaeksan Optical Astronomy Observatory (SOAO), respectively. A total of 34 spectra were obtained using the 1.8 m reflector of the BOAO equipped with the Bohyunsan Optical Echelle Spectrograph to construct the radial velocity (RV) curves of the eclipsing pair. New *BVRI* photometric light curves were also covered by using the SOAO 61cm reflector and a CCD camera. A detailed analysis of all eclipse timings shows that the orbital period of XZ CMi has varied in an upward parabolic variation superposed on a sinusoidal oscillation with a period of 38.0 yr and a semi-amplitude of 0.0071 days. From the spectral analysis, the effective temperature and the projected rotational velocity of the primary component were determined to be  $T_{\text{eff},1} = 7387 \pm 161$  K and  $v_1 \sin i = 122 \pm 6$  km s<sup>-1</sup>, respectively. Our simultaneous synthesis of the double-lined RV and *BVRI* light curves gives the reliable system parameters of XZ CMi with a mass ratio ( $q$ ) of 0.314, an orbital inclination ( $i$ ) of 81.9 deg and a large temperature difference ( $\Delta T$ ) of 2481 K. The individual masses and radii of both components are  $M_1 = 1.91 \pm 0.08 M_{\odot}$ ,  $M_2 = 0.60 \pm 0.02 M_{\odot}$ ,  $R_1 = 1.60 \pm 0.02 R_{\odot}$ ,  $R_2 = 1.13 \pm 0.02 R_{\odot}$ , respectively. Although the primary component is located inside the  $\delta$  Sct and  $\gamma$  Dor instability strips, no evidence of pulsation in the system was detected. The possible evolutionary status of XZ CMi is discussed.

### [구 SA-04] Is there a stellar companion in hybrid star HD 81817?

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HD 81817 is known as a hybrid star. Hybrid stars have both cool stellar wind properties and UV or even X-ray emission features of highly ionized atoms in their spectra. A white dwarf companion has been suggested as the source of UV or X-ray features. HD 81817 has been observed since 2004 as a part of our radial velocity (RV) survey program to search for exoplanets around K giant stars using the Bohyunsan Observatory Echelle Spectrograph (BOES) at the 1.8 m telescope of Bohyunsan Optical Astronomy Observatory (BOAO) in Korea. We obtained 84 RV measurements between 2004 and 2018 for HD 81817 and found two periodic RV variations. The obtained amplitudes of RV periods are around 200 m/s, which are significantly lower than that expected from a white dwarf companion. Furthermore, our re-analysis of the IUE spectra used by Reimers (1984) shows that the excess in UV emission can easily be explained by a pseudo-continuum of unresolved emission lines originating in the extended chromosphere of the star. We thus conclude that there are no companions of stellar mass to HD 81817. Meanwhile, we analyzed two periodicities in RV measurements and conclude that the period of 627.9 days is caused by intrinsic stellar activities based on H alpha equivalent width (EW) variations of a similar period. On the other hand, the period of 1047.8 days is likely to be caused by substellar companion which has a minimum mass of 27.6  $M_{JUP}$ , a semi-major axis of 3.3 AU, and an eccentricity of 0.17 assuming the stellar mass of 4.3  $M_{\odot}$  for HD 81817. The inferred mass puts HD 81817 b in the brown dwarf desert.

### [구 SA-05] The effects of circumstellar medium on Type Ic supernova light curve and color evolution and implications for LSQ14efd

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