SAKURAI'S OBJECT, A LATE HE-FLASH

F. KERBER, H. GRATL AND S. KIMESWENGER
Institut für Astronomie, Universität Innsbruck, Technikerstr. 25, A-6020 Innsbruck, Austria

AND

M. ROTH
Las Campanas Observatory, Carnegie Institution of Washington, Casilla 601, La Serena, Chile

We report on dramatic change in Sakurai's object (RA: 17h52m32.7s, DEC: −17d41'07", J2000.0). Discovered by the Japanese amateur astronomer Y. Sakurai in Feb. 1996, this object was first classified as a slow nova (Nakano S., Sakurai Y., Hazen M., McNaught R.H., Benetti S., Duerbeck H.W., Leibundgut B., 1996, IAU Circ. 6322). Further study revealed a spectrum rich in C, N and O-lines, but poor in hydrogen, as well as an old planetary nebula surrounding the star; it was then realized that this might be a star undergoing a late He-flash (Benetti, S. et al. 1996, IAU Circ. 6325). Despite the fact that 10 to 20 % of all low mass stars will experience a late He-flash (Iben I. Jr., MacDonald J., 1996), it is an extremely rare observational event, due to its short duration. The most recent example is V605 Aql/A 58 in 1919 (Eitter W.C., 1987, ESO Messenger, 14: see also Clayton C.G., De Marco O., 1997, AJ for a review).

In March 1997 we discovered dramatic change in the optical spectrum of Sakurai's object using the 2.5 m Du Pont telescope at Las Campanas, Chile. The dominating features now are the prominent bands of CN (bandheads at 388.8 and 421.6 nm) and C_2 (Swan-Bands at 439.2, 473.7, 516.5, 558.5 and 565.5 nm)(Kerber F., Gratl, H., Roth, M., 1997, IAU Circ. 6601) that were not evident a year ago(Duerbeck, H.W., Benetti, S., 1996, ApJ 468, L111).

Another dramatic change was the development of a strong IR excess (Kimeswenger S., Gratl,H., Kerber, F., Fouque, S. Kohle, S. Steele., 1997, IAU Circ. 6608). The optical data were obtained at UTSO's 60 cm, Las Campanas, and ESO's Dutch 90 cm. The NIR data are from the DeNIS project operated at ESO's 1 m. The IR-measurements are from ISOCAM, obtained on Feb. 25th, 1997. The energy distribution found in 1996 could be explained by a 7000 K blackbody in agreement with the observed spectrum, resembling a F-type supergiant. The 1997 energy distribution can no longer be described by a single Planck curve, and a second component of standard grain distribution (Mathis J.S., Rumpl W., Nordsiek K.H., 1977, ApJ 217) with a temperature of up to 1700 K is required as is confirmed by the ISO data. The specific output of this component is about 30 times larger than that of the stellar source. We conclude that this is the signature of very hot dust that has recently formed in an extended, optically thin shell around the star.

J. Andersen (ed.), Highlights of Astronomy, Volume 11A, 361–362.

For two reasons the dust observed in Sakurai's object must have formed most recently:

(1) Sakurai's object was not detected as an IRAS source in the 80's;
(2) The location of the dust excludes an age older than the He-flash because dust so close to a PN central star would have been destroyed long ago.

Both formation of molecules and dust are compelling evidence for an episode of mass loss from Sakurai's object. While rapid change is expected for such a star, Sakurai's object literally outpaces all predictions made by current theory (Iben I. Jr., MacDonald J., 1996).Discretionary observing time on ISO has been granted in order to follow the evolution of the freshly formed dust.

This work is financially supported by the Austrian *Fonds zur Förderung der wissenschaftlichen Forschung*, Project P-11675.