Issue No. 50 *January 2007*

DISTANT EKOs

The Kuiper Belt Electronic Newsletter

Edited by: Joel Wm. Parker

ekonews@boulder.swri.edu www.boulder.swri.edu/ekonews

CONTENTS

NEWS & ANNOUNCEMENTS

There were 12 new TNO discoveries announced since the previous issue of *Distant EKOs*:

2006 QA181, 2006 QB181, 2006 QC181, 2006 QK181, 2006 QM181, 2006 QO181, 2006 QR181, 2006 QS181, 2006 QY180, 2006 UY184, 2006 UZ184, 2006 WS195

and 5 new Centaur/SDO discoveries:

2006 QG181, 2006 QH181, 2006 QJ181, 2006 UX184, 2006 SQ372

Reclassified objects:

2004 PA108 (TNO → SDO)
2004 TT357 (TNO → SDO)
2006 QS181 (TNO → SDO)

Objects recently assigned numbers:

1999 RB216 = (137295)
1999 RE215 = (137294)
2000 OK67 = (138537)
2000 QM251 = (138628)
2001 QG298 = (139775)
2003 SS317 = (143685)
2003 US292 = (143751)
2003 UY117 = (143707)
2003 YO179 = (143991)
2004 UX10 = (144897)
2005 RM43 = (145451)
2005 RN43 = (145452)
2005 RR43 = (145453)
2005 SA278 = (145474)
2005 TB190 = (145480)
2005 UJ438 = (145486)

Current number of TNOs: 1026 (including Pluto)
Current number of Centaurs/SDOs: 195
Current number of Neptune Trojans: 5
Current number of satellites: 24 around 20 objects

Out of a total of 1226 objects:

507 have measurements from only one opposition
465 of those have had no measurements for more than a year
248 of those have arcs shorter than 10 days

(for more details, see: `http://www.boulder.swri.edu/ekonews/objects/recov_stats.gif`)

PAPERS ACCEPTED TO JOURNALS

On Pluto, Perception & Planetary Politics

D. Jewitt[1] and J. Luu[2]

[1] Institute for Astronomy, University of Hawaii, 2680 Woodlawn Drive, Honolulu, HI 96822, USA

[2] MIT Lincoln Laboratory, Lexington, MA 02420, USA

Last summer, in Prague, members of the International Astronomical Union (IAU) voted to remove Pluto from the list of planets. It is not a major planet like our own Earth, or Mars, or Jupiter, they declared; it is instead a dwarf planet along with several other diminutive but approximately round bodies in orbit about the sun. Apparently adding insult to injury, the IAUs Minor Planet Center promptly assigned Pluto a number, as they routinely do for run-of-the-mill asteroids. From now on, Pluto is 134340. Pluto's loss of planetary status, while pleasing to the many astronomers who have long viewed Pluto as a planetary usurper, has enraged others. Dark rumors of a revolution at the IAU swirl on the Internet, and pro-Pluto political action groups have formed. Pluto's reclassification has also bemused science writers and the general public, many of whom believe planethood is Pluto's right, not to be cruelly snatched away by mean-spirited astronomers. The dusty world of the IAU has never been racked by so much controversy.

To appear in: Daedalus: Journal of the American Academy of Arts and Sciences

Preprints available at `http://www.ifa.hawaii.edu/faculty/jewitt/papers/2007/JL07.pdf`

. . . .

Pluto's Spectrum from 1.0 to 4.2 μm: Implications for Surface Properties

C.B. Olkin[1], E.F. Young[1], L.A. Young[1], W. Grundy[2], B. Schmitt[3], A. Tokunaga[4], T. Owen[4], T. Roush[5], and H. Terada[6]

[1] Department of Space Studies, Southwest Research Institute, Boulder, CO, USA

[2] Lowell Observatory, Flagstaff, AZ, USA

[3] Laboratoire de Planétologie de Grenoble, CNRS-UJF, Université Joseph Fourier, Grenoble, France

[4] Institute for Astronomy, University of Hawaii, Honolulu, HI, USA

[5] NASA Ames Research Center, Moffett Field, CA, USA

[6] Subaru Telescope, National Astronomical Observatory of Japan, Hilo, HI, USA

We present spectra of Pluto's anti-Charon hemisphere obtained from the Keck and Subaru telescopes from 2.8 to 4.2 μm. Combined with 1–2.5 μm spectra from the Infrared Telescope Facility, this collective data set lets us constrain several surface frost properties. The surface area of pure nitrogen frost (as opposed to nitrogen with dissolved methane) is constrained to be 6% or less. The areal fractions of pure methane and methane dissolved in nitrogen are almost equal. The grain size of pure methane is constrained to be near 200 μm. An additional surface component with spectral properties similar to Titan tholin was necessary to fit the entire 1–4.2 μm spectrum; our best-fit model requires 21% of Pluto's anti-Charon hemisphere (by area) to be this Titan tholin component. Contrary to Sasaki et al.'s spectra of Pluto's sub-Charon hemisphere, we find no evidence for other hydrocarbons on this face of Pluto from data in the 3–3.3 μm region. We were not able to constrain the temperature of pure methane.

Published in: The Astronomical Journal, 133, 42 (2007 February)

For preprints, contact `colkin@boulder.swri.edu`

. . . .

Densities of Solar System Objects from their Rotational Lightcurves

P. Lacerda[1], **and D. Jewitt**[1]

[1] Institute for Astronomy, University of Hawaii, 2680 Woodlawn Drive, Honolulu, HI 96822, USA

We present models of the shapes of four Kuiper belt objects (KBOs) and Jovian Trojan (624) Hektor as ellipsoidal figures of equilibrium and Roche binaries. Our simulations select those figures of equilibrium whose lightcurves best match the measured rotational data. The best fit shapes, combined with the knowledge of the spin period of the objects provide estimates of the bulk densities of these objects. We find that the lightcurves of KBOs (20000) Varuna and 2003 EL_{61} are well matched by Jacobi triaxial ellipsoid models with bulk densities $992^{+86}_{-15}\,\mathrm{kg\,m^{-3}}$ and $2551^{+115}_{-10}\,\mathrm{kg\,m^{-3}}$, respectively. The lightcurves of (624) Hektor and KBO 2001 QG_{298} are well-described by Roche contact binary models with densities $2480^{+292}_{-80}\,\mathrm{kg\,m^{-3}}$ and $590^{+143}_{-47}\,\mathrm{kg\,m^{-3}}$, respectively. The nature of 2000 GN_{171} remains unclear: Roche binary and Jacobi ellipsoid fits to this KBO are equivalent, but predict different densities, $\sim$2000 $\mathrm{kg\,m^{-3}}$ and $\sim$650 $\mathrm{kg\,m^{-3}}$, respectively. Our density estimates suggest a trend of increasing density with size.

To appear in: The Astronomical Journal (2007 April)
For preprints, contact `pedro@ifa.hawaii.edu`
or on the web at `http://arxiv.org/abs/astro-ph/0612237`

. . . .

The Diverse Solar Phase Curves of Distant Icy Bodies. Part I: Photometric Observations of 18 Trans-Neptunian Objects, 7 Centaurs, and Nereid

David L. Rabinowitz[1], **Bradley E. Schaefer**[2], **and Suzanne W. Tourtellotte**[3]

[1] Center for Astronomy and Astrophysics, Yale University, P. O. Box 208121, New Haven, CT 06520-8121, USA

[2] Department of Physics & Astronomy, Louisiana State University, 234 Nicholson, Baton Rouge, LA 70803-0001, USA

[3] Astronomy Department, Yale University, P. O. Box 208121, New Haven, CT 06520-8121, USA

We have measured the solar phase curves in B, V, and I for 18 trans-Neptunian objects (TNOs), 7 Centaurs, and Nereid and determined the rotation curves for 10 of these targets. For each body we have made $\sim$100 observations uniformly spread over the entire visible range. We find that all the targets except Nereid have linear phase curves at small phase angles (0.1°–2.0°) with widely varying phase coefficients (0.0–0.4 mag deg^{-1}). At phase angles of 2°–3°, the Centaurs (54598) Bienor and (32532) Thereus have phase curves that flatten. The recently discovered Pluto-scale bodies (2005 FY9, 2003 EL61, and 2003 UB313-now known as 136199 Eris), like Pluto, have neutral colors compared to most TNOs and small phase coefficients ($\lesssim$0.1 mag deg^{-1}). Together, these two properties are a likely indication of large TNOs with high-albedo, freshly coated icy surfaces. We find several bodies with significantly wavelength-dependent phase curves. The TNOs (50000) Quaoar, (120348) 2004 TY364, and (47932) 2000 GN171 have unusually high I-band phase coefficients and much lower coefficients in the B and V bands. Their phase coefficients increase in proportion to wavelength by 0.5–0.8 mag deg^{-1} μm^{-1}. The phase curves for TNOs with small B-band phase coefficients (< 0.1 mag deg^{-1}) have a similar but weaker wavelength dependence. Coherent backscatter is the likely cause for the wavelength dependence for all these bodies. We see no such dependence for the Centaurs, which have visual albedos of $\sim$0.05.

Published in: The Astronomical Journal, 133, 26 (2007 January)
For preprints, contact `david.rabinowitz@yale.edu`
or on the web at `http://arxiv.org/abs/astro-ph/0605745`

. . . .

Time Series Photometry of the Dwarf Planet ERIS (2003 UB313)

G. Carraro[1,2], M. Maris[3], D. Bertin[2], and M.G. Parisi[2,4]

[1] Dipartimento di Astronomia, Università di Padova, Vicolo Osservatorio 2, 35122 Padova, Italy

[2] Departamento de Astronoma, Universidad de Chile, Casilla 36-D, Santiago, Chile

[3] INAF, Osservatorio Astronomico di Trieste, via Tiepolo 11, 40013 Trieste, Italy

[4] Facultad de Ciencias Astronmicas y Geofsicas de la UNLP, IALP-CONICET, Paseo del Bosque s/n, La Plata, Argentina

Context: The dwarf planet Eris (2003 UB313, formerly known also as "Xena") is the largest KBO discovered up to now. Despite being larger than Pluto and having many similarities to it, it has not been possible so far to detect any significant variability in its light curve, preventing the determination of its period and axial ratio.

Aims: We attempt to assess the level of variability of the Eris light curve by determining its BVRI photometry with a target accuracy of 0.03 mag/frame in R and a comparable or better stability in the calibration.

Methods: Eris has been observed between November 30th and December 5th, 2005 with the Y4KCam onboard the 1.0 m Yale telescope at Cerro Tololo Interamerican Observatory, Chile in photometric nights.

Results: We obtain 7 measures in B, 23 in V, 62 in R, and 20 in I. Averaged B, V, and I magnitudes as colors are in agreement within $\approx$0.03 mag with measures from Rabinowitz et al. (2006, [arXiv:astro-ph/0605745]) taken on the same nights. Night-averaged magnitudes in R show a statistically significant variability over a range of about 0.05$\pm$0.01 mag. This cannot be explained by known systematics, background objects, or some periodical variation with periods less than two days in the lightcurve. The same applies to B, V and to a lesser extent to I, due to larger errors.

Conclusions: In analogy with Pluto and if confirmed by future observations, this "long term" variability might be ascribed to a slow rotation of Eris, with periods longer than 5 days, or to the effect of its unresolved satellite "Dysnomea", which may contribute for $\approx$0.02 mag to the total brightness.

Published in: Astronomy & Astrophysics, 460, L39 (2006 December)
For preprints, contact gcarraro@das.uchile.cl
or on the web at http://arxiv.org/abs/astro-ph/0610619

. . . .

Dynamical Classification of Trans-Neptunian Objects: Probing their Origin, Evolution and Interrelation

Patryk Sofia Lykawka[1] and Tadashi Mukai[1]

[1] Kobe University, Department of Earth and Planetary System Sciences, 1-1 rokkodai, nada-ku, Kobe, 657-8501, Japan

The orbital structure of trans-Neptunian objects (TNOs) in the trans-Neptunian belt (Edgeworth-Kuiper belt) and scattered disk provides important clues to understand the origin and evolution of the solar system. To better characterize these populations, we performed computer simulations of currently observed objects using long-arc orbits and several thousands of clones. Our preliminary analysis identified 622 TNOs, and 65 non-resonant objects whose orbits penetrate that of at least one of the giant planets within 1 Myr (the centaurs). In addition, we identified 196 TNOs locked in

resonances with Neptune, which, sorted by distance from the Sun, are: 1:1 (Neptune trojans), 5:4, 4:3, 11:8, 3:2, 18:11, 5:3, 12:7, 19:11, 7:4, 9:5, 11:6, 2:1, 9:4, 16:7, 7:3, 12:5, 5:2, 8:3, 3:1, 4:1, 11:2, and 27:4. Kozai resonant TNOs are found inside the 3:2, 5:3, 7:4 and 2:1 resonances. We present detailed general features for the resonant populations (i.e., libration amplitude angles, libration centers, Kozai libration amplitudes, etc.). Taking together the simulations of Lykawka and Mukai (2006b), an improved classification scheme is presented revealing five main classes: centaurs, resonant, scattered, detached and classical TNOs. Scattered and detached TNOs (non-resonant) have q (perihelion distance)$<$37 AU and $q > 40$ AU, respectively. TNOs with 37 AU$< q <$40 AU occupy an intermediate region where both classes coexist. Thus, there are no clear boundaries between the scattered and detached regions. We also securely identified a total of 9 detached TNOs by using 4–5 Gyr orbital integrations. Classical objects are non-resonant TNOs usually divided into cold and hot populations. Their boundaries are as follows: cold classical TNOs ($i \leq 5$ degrees are located at 37 AU$< a <$40 AU ($q > 37$ AU) and 42 AU$< a <$47.5 AU ($q > 38$ AU), and hot classical TNOs ($i > 5$ degrees occupy orbits with 37 AU$< a <$47.5 AU ($q > 37$ AU). However, a more firm classification is found with $i > 10$ degrees for hot classical TNOs. Lastly, we discuss some implications of our classification scheme comparing all TNOs with our model and other past models.

To appear in: Icarus
For preprints, contact patryk@kobe-u.ac.jp
or on the web at http://harbor.scitec.kobe-u.ac.jp/~patryk/index-en.html

. . . .

Models of the Collisional Damping Scenario for Ice Giant Planets and Kuiper Belt Formation

H. Levison[1] and A. Morbidelli[2]

[1] Southwest Research Institute, USA

[2] Observatoire de la Côte d'Azur, France

Chiang et al. (2006, hereafter C06) have recently proposed that the observed structure of the Kuiper belt could be the result of a dynamical instability of a system of ~ 5 primordial ice giant planets in the outer Solar System. According to this scenario, before the instability occurred, these giants were growing in a highly collisionally damped environment according to the arguments in Goldreich et al. (2004a,b, hereafter G04). Here we test this hypothesis with a series of numerical simulations using a new code designed to incorporate the dynamical effects of collisions. We find that we cannot reproduce the observed Solar System. In particular, G04 and C06 argue that during the instability, all but two of the ice giants would be ejected from the Solar System by Jupiter and Saturn, leaving Uranus and Neptune behind. We find that ejections are actually rare and that instead the systems spread outward. This always leads to a configuration with too many planets that are too far from the Sun. Thus, we conclude that both G04's scheme for the formation of Uranus and Neptune and C06's Kuiper belt formation scenario are not viable in their current forms.

To appear in: Icarus
For preprints, contact hal@boulder.swri.edu
or on the web at http://arxiv.org/abs/astro-ph/0701544

. . . .

Are Debris Disks and Massive Planets Correlated?

Amaya Moro-Martín[1], John M. Carpenter[2], Michael R. Meyer[3], Lynne A. Hillenbrand[2], Renu Malhotra[4], David Hollenbach[5], Joan Najita[6], Thomas Henning[7], Jinyoung S. Kim[3], Jeroen Bouwman[7], Murray D. Silverstone[3], Dean C. Hines[8], Sebastian Wolf[7], Illaria Pascucci[3] Eric E. Mamajek[9], and Jonathan Lunine[4]

[1] Department of Astrophysical Sciences, Peyton Hall, Ivy Lane, Princeton University, Princeton, NJ 08544, USA

[2] Department of Astronomy, California Institute of Technology, Pasadena, CA 91125, USA

[3] Steward Observatory, University of Arizona, 933 North Cherry Ave., Tucson, AZ 85721, USA

[4] Department of Planetary Sciences, University of Arizona, 1629 E. University Boulevard, Tucson, AZ 85721, USA

[5] NASA Ames, Moffet Field, CA 94035, USA

[6] National Optical Astronomy Observatory, 950 North Cherry Ave., Tucson AZ 85721, USA

[7] Max-Planck-Institut fur Astronomie, Königstuhl 17, 69117 Heidelberg, Germany

[8] Space Science Institute, 4750 Walnut Street, Suite 205, Boulder, CO 80301, USA

[9] Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, MS-42, Cambridge, MA 02138, USA

Using data from the *Spitzer Space Telescope* Legacy Science Program "Formation and Evolution of Planetary Systems" (FEPS), we have searched for debris disks around 9 FGK stars (2–10 Gyr), known from radial velocity (RV) studies to have one or more massive planets. Only one of the sources, HD 38529, has excess emission above the stellar photosphere; at 70 μm the signal-to-noise ratio in the excess is 4.7 while at $\lambda < 30$ μm there is no evidence of excess. The remaining sources show no excesses at any *Spitzer* wavelengths. Applying survival tests to the FEPS sample and the results for the FGK survey published in Bryden et al. (2006), we do not find a significant correlation between the frequency and properties of debris disks and the presence of close-in planets. We discuss possible reasons for the lack of a correlation.

To appear in: Astrophysical Journal

For preprints, contact `amaya@astro.princeton.edu`
or on the web at `http://www.astro.princeton.edu/~amaya/publications/publications.html`

. . . .

Forced Resonant Migration of Pluto's Outer Satellites by Charon

William R. Ward[1] and Robin M. Canup[1]

[1] Department of Space Studies, Southwest Research Institute, Boulder, CO 80302, USA

Two small moons of Pluto have been discovered in low-eccentricity orbits exterior to Pluto's large satellite, Charon. All three satellite orbits are nearly coplanar, implying a common origin. It has been argued that Charon formed as a result of a giant impact with primordial Pluto. The orbital periods of the two new moons are nearly integer multiples of Charon's period, suggesting that they were driven outward by resonant interactions with Charon during its tidal orbital expansion. This could have been accomplished if Charon's orbit was eccentric during most of this orbital evolution, with the small moons originating as debris from the collision that produced Charon.

Published in: Science, 313, 1107 (2006 August 25)

For preprints, contact `ward@boulder.swri.edu`

. . . .

TNO Surface Ices — Observations of the TNO 55638 (2002 VE_{95}) and Analysis of the Population's Spectral Properties

M.A. Barucci[1], F. Merlin[1], E. Dotto[2], A. Doressoundiram[1] and C. de Bergh[1]

[1] LESIA, Observatoire de Paris, 92195 Meudon Principal Cedex, France

[2] INAF, Observatorio Astronomico di Roma, via Frascati 33, 00040 Monteporzio Catone (Roma), Italy

Aims: We investigate the surface composition of Centaurs and Trans-Neptunian objects (TNOs) to get constraints on the formation and the evolution of this population.

Methods: We report visible and near-infrared spectroscopic observations of the Plutino 55638 (2002 VE_{95}) obtained at VLT-ESO. The surface model has been computed using two types of radiative transfer models considering geographical and intimate mixtures of different materials. The obtained results have been compared with those for objects having near-infrared spectra available in the literature. The whole sample of 32 objects has been analyzed, in particular the presence of ices has been investigated in relation to their surface characteristics (taxonomic groups), their dynamical properties and the object sizes.

Results: The main result is the clear detection of H_20 and CH_3OH (or a similar molecule) on the surface of 55638. The analysis of the whole sample shows that there are no obvious trends, but the larger objects seem to be icier. The BB group also seems to show more ice content on the surface, whereas RR group may contain more organic material.

Published in: Astronomy & Astrophysics, 455, 725 (2006 August)

For preprints, contact antonella.barucci@obspm.fr

. . . .

Methane and Ethane on the Bright Kuiper Belt Object 2005 FY9

M.E. Brown[1], K.M. Barkume[1], G.A. Blake[1], E.L. Schaller[1], D.L. Rabinowitz[2], H.G. Roe[1], and C.A. Trujillo[3]

[1] Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA 91125, USA

[2] Department of Physics, Yale University, New Haven, CT 06520, USA

[3] Gemini Observatory, 670 North A'ohoku Place, Hilo, HI 96720, USA

The spectrum of the bright Kuiper Belt object 2005 FY9 from 0.34 to 2.5 μm is dominated by the red coloring of many outer solar system objects in the optical wavelength regime and by absorption due to methane in the near-infrared. The solid methane absorption lines are significantly broader on 2005 FY9 than on any other solar system body, indicating long optical path lengths through the methane. These long path lengths can be parameterized as a methane grain size of approximately 1 cm in a Hapke reflectance model. In addition to large-grained methane, the infrared spectrum also indicates the clear presence of ethane, an expected product of UV photolysis of methane. No evidence for N2 or CO, both known to be present on Pluto, is found. We suggest that the large differences between the spectrum of 2005 FY9 and that of Pluto and 2003 UB313 is due to a depletion of nitrogen on the surface of 2005 FY9 that leads to large methane grains, abundant sites for ethane formation through UV photolysis, and highly irradiated tholin-like material.

Published in: The Astronomical Journal, 133, 284 (2007 January)

Preprints on the web at www.gps.caltech.edu/~mbrown/papers

. . . .

TAOS — The Taiwanese-American Occultation Survey

M.J. Lehner[1,2], C. Alcock[1], T. Axelrod[3], F. Bianco[1,2], Y.-I. Byun[4], W.-P. Chen[5], K.H. Cook[6], R. Dave[2], I. de Pater[7], J. Giammarco[2], S.-K. King[8], T. Lee[8], J. Lissauer[9], S.L. Marshall[10], S. Mondal[5], T. Nihei[2], J. Rice[11], M. Schwamb[2], A. Wang[8], S.-Y. Wang[8], C.-Y. Wen[8], and Z.-W. Zhang[5]

[1] Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138, USA

[2] Department of Physics and Astronomy, University of Pennsylvania, 209 South 33rd Street, Philadelphia, PA 19104, USA

[3] Steward Observatory, 933 North Cherry Avenue, Room N204 Tucson AZ 85721, USA

[4] Department of Astronomy, Yonsei University, 134 Shinchon, Seoul 120-749, Korea

[5] Institute of Astronomy, National Central University, No. 300, Jhongda Rd, Jhongli City, Taoyuan County 320, Taiwan

[6] Lawrence Livermore National Laboratory, Livermore, CA 94550, USA

[7] Department of Astronomy, University of California Berkeley, 601 Campbell Hall, Berkeley, CA 94720, USA

[8] Institute of Astronomy and Astrophysics, Academia Sinica, 7F of Condensed Matter Sciences and Physics Department Building, National Taiwan University, No. 1, Roosevelt Rd, Sec. 4, Taipei 106, Taiwan

[9] NASA Ames Research Center, Moffett Field, CA 94035, USA

[10] Kavli Institute for Particle Astrophysics and Cosmology, 2575 Sand Hill Road, MS 29, Menlo Park, CA 94025, USA

[11] Department of Statistics, University of California Berkeley, 367 Evans Hall, Berkeley, CA 94720, USA

The Taiwanese-American Occultation Survey (TAOS) seeks to determine the number and size spectrum for small (∼3 km) bodies in the Kuiper Belt. This will be accomplished by searching for the brief occultations of bright stars ($R \sim 14$) by these objects. We have designed and built a special purpose photometric monitoring system for this purpose. TAOS comprises four 50 cm telescopes, each equipped with a 2048×2048 pixel CCD camera, in a compact array located in the central highlands of Taiwan. TAOS will monitor up to 2000 stars at 5 Hz. The system went into scientific operation in the autumn of 2005.

Published in: Astronomische Nachrichten, 327, 814 (2007 September)

For preprints, contact `mlehner@cfa.harvard.edu`

PAPERS RECENTLY SUBMITTED TO JOURNALS

The Evolution of Kuiper Belt Object and Centaur Binaries

D.E. Trilling[1]

[1] Steward Observatory, The University of Arizona, 933 N. Cherry Avenue, Tucson, AZ 85721, USA

Submitted to: The Astrophysical Journal Letters

. . . .

Ices on (90377) Sedna: Confirmation and Compositional Constraints

Joshua P. Emery[1,2]**, Cristina M. Dalle Ore**[1,2]**, Dale P. Cruikshank**[1]**, Yanga R. Fernandez**[3]**, David E. Trilling**[4]**, John A. Stansberry**[4]

[1] NASA Ames Research Center, Mail Stop 245-6, Moffett Field, CA 94035, USA

[2] Carl Sagan Center at the SETI Institute, 515 N Whisman Rd, Mountain View, CA 94041, USA

[3] University of Central Florida, Dept. of Physics, 4000 Central Florida Blvd, M.A.P. Building, Orlando, FL 32816-2385, USA

[4] University of Arizona, Steward Observatory, 933 N Cherry Ave., Tucson, AZ 85721, USA

Submitted to: Astronomy & Astrophysics

For preprints, contact `jemery@mail.arc.nasa.gov`

. . . .

Ammonia-Water Ice Laboratory Studies Relevant to Outer Solar System Surfaces

M.H. Moore[1]**, R.F. Ferrante**[2]**, R.L. Hudson**[3]**, and J.N. Stone**[2]

[1] NASA Goddard Space Flight Center, Greenbelt, MD 20771, USA

[2] US Naval Academy, Annapolis, MD 21402, USA

[3] Eckerd College, St. Petersburg, FL 33733, USA

Submitted to: Icarus

For preprints, contact `Marla.H.Moore@nasa.gov`

. . . .

The Formation of Ice Giants in a Packed Oligarchy: Instability and Aftermath

Eric B. Ford[1,2] **and Eugene I. Chiang**[3]

[1] Harvard-Smithsonian Center for Astrophysics, USA

[2] Hubble Fellow

[3] UC Berkeley, USA

Submitted to: The Astrophysical Journal

For preprints, contact `eford@cfa.harvard.edu`

or on the web at `astro.berkeley.edu/~echiang/ppp/ppp.html`

OTHER PAPERS OF INTEREST

New Definition of Discovery for Solar System Objects

Andrea Milani[1] , Giovanni F. Gronchi[1], and Zoran Knežević[2]

[1] Department of Mathematics, University of Pisa, Pisa, Italy

[2] Astronomical Observatory, Belgrade, Serbia

To appear in: Earth, Moon, and Planets

For preprints, contact `milani@dm.unipi.it`
or on the web at `http://www.springerlink.com/content/x1u544212723km34/`

....

Millisecond Dips in Sco X-1 are Likely the Result of High-Energy Particle Events

T.A. Jones[1,2], A.M. Levine[2], E.H. Morgan[2], and S. Rappapor[1,2]

[1] Department of Physics, MIT, Cambridge, MA 02139, USA

[2] Kavli Institute for Astrophysics and Space Research, MIT, Cambridge, MA 02139, USA

preliminary report

Preprints available on the web at `http://arxiv.org/abs/astro-ph/0612129`

....

Possible Long-term Decline in Impact Rates

William K. Hartmann[1], Cathy Quantin[2] and Nicolas Mangold[3]

[1] Planetary Science Institute, 1700 East Fort Lowell Road, Suite 106, Tucson, AZ 85719-2395, USA
[2] Laboratoire des Sciences de la Terre, UMR 5570 - CNRS, Université Claude Bernard Lyon 1 - ENS Lyon, Bat. Géode - 6e Etage, 2 rue Raphal Dubois, 69622 Villeurbanne Cedex, France
[3] Orsay Terre, Bat. 509, Universit Paris-Sud, 91405 Orsay Cedex, France

Published in: Icarus, 186, 11 (2007 January)

....

Mid-plane Sedimentation of Large Solid Bodies in Turbulent Protoplanetary Discs

Augusto Carballido[1], Sbastien Fromang[2] and John Papaloizou[2]

[1] Institute of Astronomy, University of Cambridge, Madingley Road, Cambridge, CB3 0HA, UK

[2] DAMTP, University of Cambridge, Centre for Mathematical Sciences, Wilberforce Road, Cambridge, CB3 0WA, UK

Published in: Monthly Notices of the Royal Astronomical Society, 373, 1633

For preprints, contact `S.Fromang@damtp.cam.ac.uk`
or on the web at `http://arxiv.org/abs/astro-ph/0610075`

BOOKS

Is Pluto a Planet? A Historical Journey through the Solar System

David A. Weintraub[1]

[1] Vanderbilt University, Department of Physics and Astronomy, 6301 Stevenson Center, Nashville, TN 37235, USA

This book tells the story of how the meaning of the word "planet" has changed from antiquity to the present day, as new objects in our solar system have been discovered, and how the number of possible planets has ranged widely over the centuries, from five to seventeen. This book begins with the ancient Greeks' observations that some stars wander while others don't; it then examines the paradigm shift that occurs with Copernicus, who made Earth a planet but rejected the Sun and the Moon, and then follows the continuing evolution of what astronomers have called planets by tracing the discoveries of comets, Uranus, Ceres, the asteroid belt, Neptune, Pluto, Centaurs, the Kuiper Belt, Eris, and extrasolar planets.

Contents

Princeton University Press, Nov. 2006 (ISBN: 0-691-12348-9)
More information on the web at `http://press.princeton.edu/titles/8247.html`

The *Distant EKOs* Newsletter is dedicated to provide researchers with easy and rapid access to current work regarding the Kuiper belt (observational and theoretical studies), directly related objects (e.g., Pluto, Centaurs), and other areas of study when explicitly applied to the Kuiper belt.

We accept submissions for the following sections:
⋆ Abstracts of accepted papers
⋆ Titles of submitted (but not yet accepted) papers and conference articles
⋆ Thesis abstracts
⋆ Short articles, announcements, or editorials
⋆ Status reports of on-going programs
⋆ Requests for collaboration or observing coordination
⋆ Table of contents/outlines of books
⋆ Announcements for conferences
⋆ Job advertisements
⋆ General news items deemed of interest to the Kuiper belt community

A LaTeX template for submissions is appended to each issue of the newsletter, and is sent out regularly to the e-mail distribution list. Please use that template, and send your submission to:

`ekonews@boulder.swri.edu`

The *Distant EKOs* Newsletter is available on the World Wide Web at:

`http://www.boulder.swri.edu/ekonews`

Recent and back issues of the newsletter are archived there in various formats. The web pages also contain other related information and links.

Distant EKOs is not a refereed publication, but is a tool for furthering communication among people interested in Kuiper belt research. Publication or listing of an article in the newsletter or the web page does not constitute an endorsement of the article's results or imply validity of its contents. When referencing an article, please reference the original source; *Distant EKOs* is not a substitute for peer-reviewed journals.

Moving ... ??

If you move or your e-mail address changes, please send the editor your new address. If the newsletter bounces back from an address for three consecutive issues, the address will be deleted from the mailing list. All address changes, submissions, and other correspondence should be sent to:

`ekonews@boulder.swri.edu`