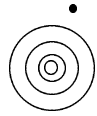


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DISTANT EKOs 
The Kuiper Belt Electronic Newsletter

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NEWS & ANNOUNCEMENTS

Two more Centaurs have been named:

1995 GO (8405) = Asbolus

1997 CU26 (10199) = Chariklo

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Did the Pioneer 10 spacecraft have a close encounter with an EKO?

Pioneer page: http://spaceprojects.arc.nasa.gov/Space_Projects/pioneer/PNhome.html

BBC story: http://news.bbc.co.uk/hi/english/sci/tech/newsid_460000/460095.stm

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There were 6 (or 7...?) new EKO discoveries announced since the previous issue of the *Distant EKOs* Newsletter:

1999 KR18, 1999 OC4, 1999 OD4, 1999 OE4, 1999 OF4, 1999 TR11

Then, there is the question of 1999 TD10, which with a current heliocentric distance of 13 AU was assumed to be a Centaur (MPEC 1999-T46). However, followup observations now give a nominal solution of a semi-major axis of 155 AU, although "The semimajor axis could be as small as 75 AU. A parabolic orbit also fits the data." (MPEC 1999-V07). At the moment, 1999 TD10 is not listed by the Minor Planet Center as either a Centaur or an EKO, though it apparently is a related scattered disk-type object. This unusual object clearly warrants further observations.

MPEC 1999-T46 — <http://cfa-www.harvard.edu/mpec/J99/J99T46.html>

MPEC 1999-V07 — <http://cfa-www.harvard.edu/mpec/J99/J99V07.html>

One Centaur discovery was reported minutes before this issue was sent out:

1999 UG5

Current number of EKOs: 197 (and Pluto & Charon)

Current number of Centaurs: 16

PAPERS ACCEPTED TO JOURNALS

Light curves of the Trans-Neptunian Objects 1996 TP66 and 1994 VK8

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We have obtained a number of CCD images of two Trans-Neptunian Objects, 1994 VK8 and 1996 TP66, over two nights. The changes in magnitude of these objects were then examined, in a search for periodic variation. In the case of 1996 TP66 nothing other than random noise could be found to within the errors of ~ 0.04 magnitudes. Though a periodic signal was found for 1994 VK8 it appears to be an artifact, as the same frequency appears in the variation of sky brightness and is probably due to the sampling of the data. However 1994 VK8 did exhibit a variation of ~ 0.5 magnitudes. This would suggest either significant non-sphericity or a change in surface composition over a large area. In either case 1994 VK8 warrants further investigation.

Published in: Monthly Notices of the Royal Astronomical Society (vol 308, p 588)

For preprints, contact S.C.Brown@qub.ac.uk

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Spectrophotometry of Four Kuiper Belt Objects with NICMOS

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We have obtained spectrophotometric observations of four Kuiper Belt objects using the Hubble Space Telescope's Near Infrared Camera and Multi-Object Spectrometer, NICMOS, in broad and medium bandwidth filters selected to search for the presence of strong solid state spectral features in the 1.6-2.2 μm range. We find distinct differences in the spectra of the four objects. The spectra of 1996 TQ₆₆, 1996 TP₆₆, and 1996 TS₆₆ are broadly similar; red optical colors and red-neutral colors from 1.0-2.5 μm . 1996 TS₆₆ and 1996 TQ₆₆ show evidence of an absorption feature near 1.9 μm . This feature is unidentified, but is inconsistent with water ice. In sharp contrast, the reflectance of 1996 TO₆₆ drops by more than a factor of two from 1 - 2 μm and displays discrete features consistent with absorption by water ice as reported by others. The surface composition of Kuiper Belt objects as revealed by infrared observations is considerably more complex than the suggested by the possible bimodal distribution of optical colors in these objects.

To appear in: Astronomical Journal, February 2000

For preprints, contact noll@stsci.edu

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Spectrophotometric Observations of Edgeworth-Kuiper Belt Objects

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The Edgeworth-Kuiper Belt (EKB) objects are fossil remnants of the formation of the Solar System and they represent an important reservoir of primordial, thermally unprocessed material. The study of these objects has rapidly evolved in the last few years. The new observational works allowed the planetary scientists to investigate evolutionary and dynamical processes in the outer solar system, putting some constraints on, for example, the origin of comets and the accretion of planetesimals. The chemical and physical information on this population is still very poor: intensive observational studies are needed. For this reason we started in 1997 a spectrophotometric observation programme at ESO with the NTT telescope to investigate the EKB. We present the obtained results for six objects (1994 JR₁, 1994 TB, 1995 QY₉, 1996 TL₆₆, 1996 TO₆₆, and 1996 TP₆₆). We analysed all the *B*, *V*, *R*, and *I* data available in the literature to investigate some bulk properties. We found an indication of a complex and inhomogeneous population.

To appear in: Icarus, vol. 142

For preprints, contact barucci@obspm.fr

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Triton's Surface Age and Impactor Population Revisited in Light of Kuiper Belt Fluxes: Evidence for Small Kuiper Belt Objects and Recent Geological Activity

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Neptune's largest satellite, Triton, is one of the most fascinating and enigmatic bodies in the solar system. Among its numerous interesting traits, Triton appears to have far fewer craters than would be expected if its surface was primordial. Here we combine the best available crater count data for Triton with improved estimates of impact rates by including the Kuiper Belt as a source of impactors. We find that the population of impactors creating the smallest observed craters on Triton must be sub-km in scale, and that this small-impactor population can be best fit by a differential power-law size index near -3 . Such results provide interesting, indirect probes of the unseen small body population of the Kuiper Belt. Based on the modern, Kuiper Belt and Oort Cloud impactor flux estimates, we also recalculate estimated ages for several regions of Triton's surface imaged by Voyager 2, and find that Triton was probably active on a time scale no greater than 0.1–0.3 Gyr ago (indicating Triton was still active after some 90% to 98% of the age of the solar system), and perhaps even more recently. The time-averaged volumetric resurfacing rate on Triton implied by these results, $0.01 \text{ km}^3 \text{ yr}^{-1}$ or more, is likely second only to Io and Europa in the

outer solar system, and is within an order of magnitude of estimates for Venus and for the Earth's intraplate zones. This finding indicates that Triton likely remains a highly geologically active world at present, some 4.5 Gyr after its formation. We briefly speculate on how such a situation might obtain.

To appear in: The Astronomical Journal
For preprints, contact `alan@boulder.swri.edu`

Disappearance of Stellar Debris Disks around Main-sequence Stars after 400 Million Years

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Almost 5 billion years ago, the Sun formed in a local contraction of a cloud of molecular gas. A rotating disk of gas and dust is believed to have fed material onto the proto-Sun for the first few million years of its life, and to have formed the planets, comets and other Solar System objects. Similar disks, but with less mass, have been observed around a few main-sequence stars such as Vega. The dust particles orbiting stars like Vega will be removed on timescales of the order of 1 Myr (Vega is about 350 Myr old), and therefore must be resupplied, at least for a time. But earlier surveys lacked the sensitivity to determine how many nearby stars have dust disks, and which ones truly do not have a disk. Here we report infrared observations on a sample of 84 stars indicating that most stars younger than 300 Myr have dust disks, while most older than 400 Myr do not: ninety per cent of the disks disappear when the star is between 300 and 400 Myr old. Several events that are related to the “clean up” of debris in the early history of our Solar System have a similar timescale.

Published in: Nature, 401, 456 (1999 September 30)

Preprints can be obtained via ftp at: `ftp://strw.leidenuniv.nl/pub/habing/nature.ps.gz`

CONFERENCE INFORMATION

IAU Colloquium 180: Towards Models and Constants for Sub-microarcsecond Astrometry

27–31 March 2000

U.S. Naval Observatory, Washington, DC, USA

<http://aa.usno.navy.mil/colloq180/>

The adoption of the International Celestial Reference System (ICRS) by the XXIII General Assembly of the IAU has provided an improved reference system for positional astronomy. The major purpose of this colloquium is to prepare resolutions for consideration by the XXIV IAU General Assembly that will complete the specification of the ICRS. These resolutions will, in effect, specify definitions, standard algorithms, and parameters that link observable quantities with reference coordinates within the ICRS system. Specifically to be recommended are definitions of the celestial ephemeris pole and celestial ephemeris origin, an improved precession/nutation theory, and a new set of standard values for astronomical constants.

This colloquium will also discuss future requirements of the celestial reference system that are necessary to support present and planned high-precision astrometric programs. The microarcsecond-level of precision anticipated for future observational systems demands improved models at all levels of analysis. These improved models are likely to require increased attention to the definitions of the various reference frames involved and the transformations between them, within a well defined relativistic framework.

US - European Celestial Mechanics Workshop

3-7 July 2000

Adam Mickiewicz University, Poznan, Poland

<http://www.astro.amu.edu.pl/Science/Conference>

The primary purpose of the Workshop is to develop collaborative research activities in Celestial Mechanics between young scientists in the US and the former Eastern Block countries. However, this goal cannot be accomplished without the recognition and assessment of current research activities in Celestial Mechanics worldwide. To that end, various aspects of theoretical and applied Celestial Mechanics will be discussed to establish the current status and prospects for future research in this branch of astronomy.

The expectation is that out of this workshop will come proposals for collaborative research grants in Celestial Mechanics. The Workshop is to present review papers on selected subjects along with contributed papers and poster papers. Each Workshop session will be followed by a discussion about the prospects of future research on the session topic.

The Workshop will comprise approximately 12 sessions each with a preliminary review paper for each topic followed by a limited number of contributed papers. Workshop sessions are to be divided among the broad categories listed below:

1. Chaos, Resonances & Stability
2. Kuiper Belt Objects
3. Satellites, Minor Planets, Comets, and Meteors
4. Orbit Uncertainty and Error Analysis for NEO and Artificial Satellites
5. Stellar and Galactic Dynamics
6. Drag and Atmospheric Modeling & Theory (Non-gravitational Force Modeling)
7. Numerical Methods, Parallel Processing, Ephemeris Generation
8. Satellite Constellation Dynamics and Control
9. Orbit and Attitude Dynamics
10. NEO and Debris Observations and Motions
11. Reference Systems for Astronomy and Astrodynamics
12. Exo-planetary systems

For further information, visit the website: <http://www.astro.amu.edu.pl/Science/Conference>
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IAU Symposium 202: Planetary Systems in the Universe - Observation, Formation and Evolution

7-10 August 2000
Manchester, UK

<http://astro1.bnsc.rl.ac.uk/symp202/>

The main topics of the symposium will be:

- Discovery and study of extrasolar planets — current
- Progress in the theory of planet formation
- Structure and evolution of planets
- Protoplanetary and Beta Pic disks
- Discovery and study of extrasolar planets — future

The aim of the symposium is to join the new extra-solar planet discoveries, the observations of dust disks round stars and other planetary system and Solar System observations into the context of our theories of the formation and evolution of planetary systems. A goal will be to consider how future observations and searches and theoretical studies can best work together. It is hoped to bring together planetary system and Solar System observers and theoreticians.

For further information, visit the website: <http://astro1.bnsc.rl.ac.uk/symp202/>
or send e-mail to: symp202@ast.star.rl.ac.uk

JOB ANNOUNCEMENTS

It is the time of year when job announcements are more plentiful. The AAS Job Register is an excellent centralized source for astronomy jobs: postdoctoral, tenure-track, education/public outreach, research, teaching, etc. 82 new positions were announced in October and 86 in November. Though none explicitly mentioned Kuiper Belt research, quite a few were interested in applicants with related skills (observation, dynamics, numerical modeling, solar system formation, planetary science, instruction), so rather than list the jobs here, I recommend perusing the Job Register at the following address link:

<http://www.aas.org/JobRegister/aasjobs.html>

The *Distant EKO*s 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 L^AT_EX 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 EKO*s 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 EKO*s 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 EKO*s 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`