

*Issue No. 39*

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***DISTANT EKOs***  
*The Kuiper Belt Electronic Newsletter*



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## NEWS & ANNOUNCEMENTS

There were 25 new TNO discoveries announced since the previous issue of *Distant EKOs*:

1999 LB37, 2002 VD138, 2003 WA191, 2004 TB358, 2004 TT357, 2004 TU357,  
2004 TV357, 2004 TW357, 2004 TX357, 2004 UD10, 2004 UE10, 2004 UF10,  
2004 VA76, 2004 VK78, 2004 VL78, 2004 VM78, 2004 VN78, 2004 VS75, 2004 VT75,  
2004 VU75, 2004 VV75, 2004 VW75, 2004 VX75, 2004 VY75, 2004 VZ75

and no new Centaur/SDO discoveries

Reclassified objects:

2004 PA112 (SDO → TNO)

Objects recently assigned names:

2004 DW = Orcus

Deleted objects:

2004 RT9 (incorrectly identified as a Centaur in the previous issue)

Current number of TNOs: 848 (and Pluto & Charon, and 12 other TNO binary companions)

Current number of Centaurs/SDOs: 149

Current number of Neptune Trojans: 1

Out of a total of 998 objects:

478 have measurements from only one opposition

402 of those have had no measurements for more than a year

203 of those have arcs shorter than 10 days

(for more details, see: [http://www.boulder.swri.edu/ekonews/objects/recov\\_stats.gif](http://www.boulder.swri.edu/ekonews/objects/recov_stats.gif))

## Crystalline Water Ice on Kuiper Belt Object (50000) Quaoar

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The Kuiper Belt is a disk-like structure consisting of solid bodies orbiting the Sun beyond Neptune. It is scientifically interesting as the source of the short-period comets and as the likely repository of the solar system's most primitive materials. Surface temperatures in the belt are low ( $\sim 50$  K), suggesting that ices trapped at formation should be preserved over the age of the solar system. Unfortunately, most Kuiper Belt Objects are too faint for meaningful compositional study even using the largest available telescopes. Water ice has been reported in a handful of objects, but most appear spectrally featureless. Here we report new, near-infrared wavelength observations of large Kuiper Belt Object (50000) Quaoar in which crystalline water ice and ammonia hydrate are detected. Crystallinity indicates that the ice has been heated to at least 110 K. Ammonia hydrate on the surface is destroyed by energetic particle irradiation on a timescale  $\sim 10^7$  yr. We conclude that Quaoar has been recently resurfaced, either by impact exposure of previously buried (shielded) ices or by cryovolcanic outgassing, or by a combination of these processes.

**Published in:** *Nature*, **432**, 731 (2004 December 9)

*Preprints on the web at* <http://www.ifa.hawaii.edu/~jewitt/papers/50000/Quaoar.pdf>

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## Stellar Encounters as the Origin of Distant Solar System Objects in Highly Eccentric Orbits

Scott J. Kenyon<sup>1</sup> and Benjamin C. Bromley<sup>2</sup>

<sup>1</sup> Smithsonian Astrophysical Observatory, 60 Garden Street, Cambridge, MA, 02138, USA

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The Kuiper belt extends from the orbit of Neptune at 30 AU to an abrupt outer edge about 50 AU from the Sun. Beyond the edge is a sparse population of objects with large orbital eccentricities. Neptune shapes the dynamics of most Kuiper belt objects, but the recently discovered planet 2003 VB12 (Sedna) has an eccentric orbit with a perihelion distance of 70 AU, far beyond Neptune's gravitational influence. Although influences from passing stars could have created the Kuiper belt's outer edge and could have scattered objects into large, eccentric orbits, no model currently explains the properties of Sedna. Here we show that a passing star probably scattered Sedna from the Kuiper belt into its observed orbit. The likelihood that a planet at 60–80 AU can be scattered into Sedna's orbit is about 50 per cent; this estimate depends critically on the geometry of the fly-by. Even more interesting is the  $\sim 10$  per cent chance that Sedna was captured from the outer disk of the passing star. Most captures have very high inclination orbits; detection of such objects would confirm the presence of extrasolar planets in our own Solar System.

**Published in:** *Nature*, **432**, 598 (2004 December 2)

*For preprints, contact* [skenyon@cfa.harvard.edu](mailto:skenyon@cfa.harvard.edu)

*or on the web at* <http://arxiv.org/abs/astro-ph/0412030>

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# Occultations of Stars Brighter Than 15 mag by the Largest Trans-Neptunian Objects in 2004–2014

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We computed the occultations of stars brighter than 15 mag by the largest trans-Neptunian objects (TNOs) for the next ten years. In our search, we used the following catalogs: Hipparcos; Tycho2 with the coordinates of 2838666 stars taken from UCAC2 (Herald 2003); and UCAC2 (Zacharias et al. 2003) with 16356096 stars between 12.00 mag and 14.99 mag north of -45 deg declination. We predicted the occultations of stars by the seventeen largest numbered TNOs, the recently discovered 2004 DW, and four known binary Kuiper Belt objects. We selected 64 events at Solar elongations of no less than 30 deg, including the extremely rare occultation of a 6.5 mag star by the double asteroid (66652) 1999 RZ253 on October 4, 2007. Observations of these events by all available means are extremely important, since they can provide unique information about the sizes of TNOs and improve our knowledge of their orbits dramatically.

**Published in: *Astronomy Letters*, 30, 630 (2004 September)**

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## PAPERS RECENTLY SUBMITTED TO JOURNALS

### The High-Albedo Kuiper Belt Object (55565) 2002 AW197

Dale P. Cruikshank<sup>1</sup>, John A. Stansberry<sup>2</sup>, Joshua P. Emery<sup>1,3</sup>, Yanga R. Fernandez<sup>4</sup>, Michael W. Werner<sup>5</sup>, David E. Trilling<sup>2</sup>, and George H. Rieke<sup>2</sup>

<sup>1</sup> NASA Ames Research Center, Moffett Field, CA 94035, USA

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<sup>3</sup> SETI Institute

<sup>4</sup> Institute for Astronomy, University of Hawaii, Honolulu, HI 96822, USA

Submitted to: The Astronomical Journal Letters

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## OTHER PAPERS OF INTEREST

### How Neptune Pushed the Boundaries of Our Solar System

A. Morbidelli<sup>1</sup>

<sup>1</sup> Observatoire de la Côte d'Azur, B.P. 4229, 06304 Nice Cedex 4, France

Science, 306, 1302 (2004 November 19)

*For preprints, contact* [morby@obs-nice.fr](mailto:morby@obs-nice.fr)

*or on the web at* [http://www.obs-nice.fr/morby/Invited\\_list.html](http://www.obs-nice.fr/morby/Invited_list.html)

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### Volcanoes on Quaoar?

David J. Stevenson<sup>1</sup>

<sup>1</sup> Division of Geological and Planetary Sciences, Caltech 150-21, Pasadena, CA 91125, USA

Nature, 432, 681 (2004 Dec 9)

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### Planets and IR Excesses: Preliminary Results from a Spitzer/MIPS Survey of Solar-Type Stars

C.A. Beichman<sup>1</sup>, G. Bryden<sup>1</sup>, G.H. Rieke<sup>2</sup>, J.A. Stansberry<sup>2</sup>, D.E. Trilling<sup>2</sup>,  
K.R. Stapelfeldt<sup>1</sup>, M.W. Werner<sup>1</sup>, C.W. Engelbracht<sup>2</sup>, M. Blaylock<sup>2</sup>,  
K.D. Gordon<sup>2</sup>, C.H. Chen<sup>1</sup>, K.Y.L. Su<sup>2</sup>, D.C. Hines<sup>2</sup>

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*Preprint available on the web at:* <http://arxiv.org/abs/astro-ph/0412265>

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# CONFERENCE INFORMATION

## Trans-Neptunian Objects and Comets

Winter School (Saas Fee 35)

2005 March 13-18

Mürren, Switzerland

<http://www.phim.unibe.ch/rosina/kurs/index.html>

The Swiss Society for Astronomy and Astrophysics holds every year a winter school called the Saas Fee school. This advanced course is typically for PhD students and new Post-Docs. The Saas Fee course in 13-18 March 2005 will be about “Trans-Neptunian Objects and Comets” and will be held in Murren (south of Berne), Switzerland. The lecturers will be Dave Jewitt, Alessandro Morbidelli and Heike Rauer. You may find more information and pre-registration at the URL above.

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## Protostars and Planets V

2005 October 24–28

Hilton Waikoloa Village, The Big Island, Hawaii, USA

<http://www2.ifa.hawaii.edu/cspf/ppv/ppv.html>

### Call for Talks

The Protostars and Planets meetings date back to 1978, when Tom Gehrels had the vision to “develop the interface between studies of star formation and those of the origin of the solar system”. Throughout a series of highly successful meetings, the overall goal has remained to bring scientists from the star formation community, planetologists, and meteoriticists together approximately every seven years to review what we have learned in these areas and their interfaces. The discovery of extrasolar planets, and rapid advances in our understanding of circumstellar disks, planet formation, the Kuiper belt, and chondrule and CAI formation, to mention only a few areas, promise that PP-V will be an exciting meeting. The goals of the meeting are four-fold: 1) to present an overview of our current understanding with special focus on the major areas of progress since PP-IV; 2) to bring researchers together for discussions and exchanges of ideas; 3) to strengthen future interdisciplinary research in these areas; and 4) to encourage the participation of young researchers and advanced students in these fields of research.

The PP-V conference will give an overview of star and planet formation processes, recent results in planetary science, the early solar system, and meteoritics. Topics will include:

- Cloud Cores and Collapse
- Binary and Multiple Star Formation
- Protostars and Embedded Clusters
- Jets and Outflows
- Disk Accretion and Eruptive Phenomena
- Chemistry and Evolution of Disks
- Early Stages of Brown Dwarfs
- Herbig Ae/Be Stars and Young OB Stars
- Planet Formation and Exoplanets
- Meteorites and the Early Solar Nebula
- Satellites and Rings

- Kuiper Belt Objects and Comets
- Interplanetary and Interstellar Dust
- Planets and Debris Disks

*We are now inviting the community to submit proposals for review talks and invited talks at PP-V.* If you would like to submit a proposal in your area of expertise, please send an abstract summarizing the science you suggest to present. Review talks will summarize developments and key issues within a larger topic, while invited talks will focus on specific subtopics. Proposers of review talks are encouraged to form teams of experts within an area, who will work together on the corresponding chapter for the PP-V book. All *proposals submitted before January 31, 2005* will be considered together by the Scientific Advisory Committee, which will then recommend a list of speakers to the Organisers. *Proposals should be submitted to [ppv@ifa.hawaii.edu](mailto:ppv@ifa.hawaii.edu).* Historically there have been many more proposals than speaking slots at the PP conferences, and most presentations at PP-V will therefore be in the form of posters, for which ample space and time will be devoted. Calls for poster papers will be made during the spring of 2005.

All efforts will be made to publish the PP-V book as fast as possible after the meeting, while the content still reflects the current status of the field. It is therefore essential that speakers at the PP-V meeting arrange their schedule such that they can work on and complete their chapters within a few months following the meeting.

As further information becomes available, it will be posted at the web site of the conference:

<http://www2.ifa.hawaii.edu/cspf/ppv/ppv.html>

You can also sign up at this web site for short bulletins which will be circulated by e-mail.

#### **Organisers:**

*Bo Reipurth* (Chair) (Institute for Astronomy, Univ. of Hawaii, USA)

*David Jewitt* (Institute for Astronomy, Univ. of Hawaii, USA)

*Klaus Keil* (Hawaii Institute for Geophysics, Univ. of Hawaii, USA)

#### **Scientific Advisory Committee:**

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*Jun-Ichi Watanabe* (National Astronomical Observatory, Tokyo, Japan)

*Hans Zinnecker* (Astrophysikalisches Institut, Potsdam, Germany)

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<sup>A</sup>T<sub>E</sub>X 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`