

The Refractor

The Bulletin of the Eastbay Astronomical Society
 Founded in 1924 at Chabot Observatory, Oakland, California

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November 2004's talk—Special Presentation:

Hunting for Worlds Around Other Stars

Saturday, November 6, 2004, 7:00 pm
 Speaker: Debra Fischer, PhD
 Prof of Astronomy, SF State Univ

Chabot Space & Science Center
 MegaDome Theatre, Spees Building

The first planet was discovered orbiting a star other than the Sun in 1995. Since then, 133 planets have been detected around other stars. The first *extra-solar* planets were all Jupiter-sized, but as time and technique advanced, smaller and smaller planets have been discovered—Saturn-sized, and now a new classification of what researchers are calling *super earths*—planets the size of Neptune, with an Earth-like mass. These discoveries have launched a new direction of research for NASA, and pave the way for finding planets that seem more like Earth. Dr. Fischer will present a non-technical overview of these discoveries—



Dr. Fischer in Leah's dome at Chabot
 Photo by Carter Roberts

how they are being detected, how our solar system compares with others, and the implications for the possibility of life in the galaxy.

Debra Fischer, fell under Dr. Geoff Marcy's gravitational influence while taking his classes at San Francisco State University. She then went on to get her PhD in astrophysics at UC Santa Cruz. She joined the Marcy/Butler search team in '97 heading the planet search at Lick Observatory. She is



Artist's View of Planet around the Star HD 209458
 NASA and G. Bacon (STScI) • STScI-PRC01-33

now the Project Manager for a key science project to find planets using the Space Interferometry Mission. She is also a project scientist for the automated planet finder, being built now for commissioning next September. She is a Professor of Astronomy at San Francisco State University, and is the first person in history to discover a multiple planet system in space.

After Dr. Fischer's presentation in the MegaDome theatre, we will move to the cafeteria for refreshments and socializing. Anyone wishing to ask her questions or otherwise discuss her extra-solar planet research, further, may do so at that time.



There will be no Dinner with the Speaker this month.

Regretfully, Dr. Fischer's schedule did not permit.

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Ever wonder, why are we here?

By Jim Scala

In 1943, culminating his lecture series on life, Edwin Schrödinger summarized his conclusions with this elegantly simple statement, "A living cell creates order from disorder." His series included discussion of the second law of thermodynamics which states that natural processes trend towards a state of lowest energy and maximum disorder, always losing some energy in the process. The lost energy that ultimately disappears (increasing disorder) into the void, usually as heat, is called *entropy*. Schrödinger's statement elegantly expresses the unique interaction between life and energy which is controlled by the second law of thermodynamics.

Another expression of Schrödinger's conjecture is, "Life complicates entropy." It means that living things can slow down, even stop and, by adding energy from another system, reverse, at least for a time, natural non-reversible processes. Many examples of Schrödinger's conjecture are all around us, but the green plant is especially appropriate. Let's conduct an imaginary observation on a natural system.

Imagine the sun shining 24 hours on a rock. It would heat up as the day progressed and then cool down at night as the heat radiated back into space; in other words, the rock returned to ambient temperature. In conclusion, the solar energy that the rock absorbed during the day dissipated at night into the void, increasing the entropy of the universe. Now imagine the same rock with a green plant shading it from the sun. This time the rock remains cool because the green plant absorbs and converts the solar energy into chemical energy as plant sugars. By watching endlessly, we'd see the plant grow, die, decay and become part of petroleum deposits possibly lasting for millions if not billions of years. If the oil isn't ever used to run an SUV, the solar energy thus trapped will finally be released as heat. When our sun explodes, the oil burns and increases the entropy of the universe. The green plant didn't change the direction nor the outcome of the process, it simply complicated the rate at which it progressed; hence, it complicated entropy which is the energy's final form.

Think of the second law as *times arrow* because it determines the direction that all natural processes are headed. In that context, living things have a very special or unique place, because while they can't change their direction, they can change the rate at which they proceed. Nature is filled with examples. While green plants are obvious, the organisms that inhabit deep-sea volcano vents do the same thing. They use the energy trapped in sulfur-containing gasses and convert them into chemical energy, the same sugars the green algae on the ocean's surface produce. Similarly, when beavers block a flowing stream to create an ecosystem, they store energy as food. Consequently, they complicate the entropy that would have been generated as the water cascaded back to the sea. This same thing happens when we use radioactive decay, wind energy, and tidal energy to generate electricity, to name just a few.

Indeed, while we are net energy users, we do store energy. For example, there is probably enough energy saved in nu-

clear bombs to light most cities for a millennium. Collectively, people probably burn millions of years of solar energy accumulated as petroleum every day even though we express it as barrels of oil and not as accumulated time or latent entropy. So, while we have the ability to complicate the formation of entropy as Schrödinger so beautifully explained, we remain net energy users and not savers. Indeed, green plants have lead in the entropy complication department; however, we have the ability to do far better than green plants.

Dyson Spheres and Kardashev's civilizations.

In 1960, Freeman Dyson published a paper in *Science* teaching that a truly advanced civilization would figure out how to trap all the energy radiated from its sun. Hence the *Dyson Sphere*, as it came to be known, encloses an entire sun, trapping most of its energy. Following on Dyson's conjecture, Nikolai Kardashev, in 1964, proposed classifying civilizations according to their energy use. A Type I Kardashev civilization uses all natural energy sources available on its home planet; according to this, we're probably an infantile Type I, say Type 0. Type II, a significantly advanced civilization, uses all the energy radiated by its sun. Type III, super advanced, harnesses the energy output of its entire home galaxy. We'd see these civilizations as infrared sources in which heat, as dictated by the second law of thermodynamics, escapes into space.

Time's arrow and evolution.

Energy use (and storage) is basic for life. Efficient energy use allows a species to grow, reproduce, compete for resources, and, in general, to thrive. Hence, many scientists credit the second law as the driving force behind evolution. They summarize it like this: *Do it better!* It's not a difficult stretch to conclude that this driving force in a favorable environment will lead to intelligence. For example, while beavers can use the energy of flowing water to create a micro habitat in which they thrive, they have no sophisticated technology and can't build a Dyson Sphere. Similarly, dolphins have developed intelligence and use very complex strategies to harvest energy in sea creatures, but their environment doesn't nurture technology so they are trapped in an evolutionary cul-de-sac. So, intelligence will win out because it can complicate entropy best, but the environment is critical for the concepts proposed by Dyson and Kardashev.

Does this conclusion imply a grand scheme?

Whenever I (or others) propose a direction to evolution imposed by something besides random events, I am applauded by some and booed by others, even though I don't take a stand with either group. Indeed, in the 1950s, the book *Time's Arrow and Evolution* summarized it beautifully with no conclusion one way or the other by the author. In 1995, Sir Martin Rees taught (his book appeared in 2000) that with very slight change in any one of six physical constants, life couldn't exist and he (and others) asked, "Was our universe

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Editor's News 'n Views



Howdy Astro Fans!

The Dark Times are upon us <yay!> The end of Daylight Saving Time occurs Sunday, October 31st this year, so y'all can stay out later to get some extra helpings of Halloween astro candy—Milky Way and Mars bars, Moon Pies, Pop

Rock Asteroids, the list goes on and on. How nice! And if Halloween isn't scary enough for you, don't worry; Election Day 2004 is just two days after, and it looks like just about half the country is going to be in for a nasty shock. Whatever happens, just remember: the stars will still shine down upon all of us—no matter what.

But, enough of the mushy stuff. I wanted to take a moment to thank all the contributors to the newsletter this past year who've made this publication a wonderfully diverse and fascinating read for all of us. The stories, articles, and reports our members send in really make this newsletter interesting, educational, and fun, so THANK YOU for sharing! May we continue to hear from you (and hopefully many others) in future issues.

Besides the silly and insignificant nationwide one, we've got a club election coming up; nominations are for the incumbents: Pres—Carter Roberts, Vice Pres—Phil Crabbe, Secretary—Linda Lazeretti, Treasurer—Don Stone, Editor—Don Saito, Events Coord—Dave Rodrigues, Dir of Telescope Makers' Workshop—Paul Zurakowski, Dir of Equipment—Ken Swagerty, Groups Coord—Terry Galloway, Librarians—Paul Hoy and Frank Creese, Membership Registrar—Bruce Skelly, and Board Members Alan Fisher, Conrad Jung, Alan Roche, and George Roush. We could use a few more Board Members, and our liaisons with the Galaxy Explorers (Kenny Oslund and Ho-Hin Choy) need to be replaced. If you're interested in helping to keep this club alive, we would love to have you join us!

Speaking of volunteering for the club, I'm looking for a couple of people to help me with producing the newsletter - an Assistant Editor, and/or a Writer. The job would essentially entail writing or acquiring newsletter articles each month. I don't always have enough time to do this, and it would be nice to have someone whose sole job is to do that one thing. The AE would find people to write articles about any aspect of astronomy or the space sciences, or find articles and get permissions for us to reprint, or even research and write articles, themselves. I would also like to find a Writer, who could do a monthly article on a regular feature, for example, a "What's Up" column that de-

scribes what deep-sky objects are up that month, or what unusual planetary event is happening, that sort of thing. It wouldn't have to be about viewing, either - it could be about book reviews, or equipment reviews, or whatever interests you (astronomy or space related, of course). These are the more fun parts of the job that I thought I could entice someone into doing. I'll do all the hard stuff (handling the format, printing, stamping, folding, stapling, addressing - you know, the grunt work). I'm ALSO looking for someone to help with keeping our website up-to-date with interesting daily news blurbs. If you've got a little web editing experience (or would like to learn), and if you like keeping people informed of the latest news in our field of interest, let me know.

Our Members Only View Night was rained out in an unusual-for-October spate of weather affrontery, so Ma Nature owes us some decent conditions on Sunday, November 14. I'll send out a message one or two days before to remind those of you with email—the rest of you will just have to do it the old fashioned way and mark your calendars!



*Rachel the 20" refractor is 89 years old!
Photo by Carter Roberts*

Newsletter Vol and Iss Renumbering

Oh, you probably didn't notice it, but the last two issues of the newsletter (August and September) were a little *odd*, in that they were numbered somewhat differently. If you look at the upper-right corner on the front page of each issue, you'll notice a volume and an issue number. The volume indicates the year since the club's inception, and the issue number tells which month that particular newsletter was published. Unless something really dramatic has occurred with the calendar that no one told me about, there is no 13th or 14th month in the year, yet the August and September 2004 issues were so numbered. Why is that, you may wonder. It was to get the volume and issue number to match our current *membership* year, which runs from November through to the end of October.

For reasons too complex to outline here (having to do with Sky & Telescope subscriptions, and the fact that the EAS used to take a "summer vacation" from club activities), our first newsletter of the year occurred in September, despite the fact that our membership year begins, as I mentioned above, in November. I felt this was too confusing for our members, and could potentially hurt or impede our efforts to acquire membership renewals. We would ask for people to renew before November, yet the newsletters they were receiving in the two months prior to November were numbered issues #1 and #2, which could have made them think, "I must have already renewed, if I'm getting the first and second issues." Not quite earth shaking news, or even particularly interesting, but I had to put the explanation in, nonetheless, lest anyone think I'm crazy for numbering issues for 14 months in a year. I'm crazy, but I'm not THAT crazy!

That's it for now. See you - IN THE FUTURE! ★

Wonder?
Continued from Page 2

designed for life?" These questions raise the obvious question, "Does life have purpose?" I say that if it does, complicating entropy is a fundamental feature. With or without life, our universe will eventually become a very cold place and I submit that our remote evolutionary progeny will at some distant time start projects to slow it down.

Is anything happening now to support this conclusion?

Freeman Dyson in his recent lecture series proposed that our transition to *Space Man* would be less difficult than leaving the water and setting up on land. Building on his conjecture, I submit that the seeds of this next transition, albeit remote, are already being sown. We are in the infant stages of genetic manipulation which will lead to directing our own evolution. Dyson's type leaps to *space man*, probably requires that *man and machine* team up. This transition is already in its infancy by the use of artificial joints, but even more with the implantation of chips in the brain of afflicted people to stop seizures. Indeed, our emerging intelligence can probably accelerate and make evolution more efficient because many cul-de-sacs that would normally occur in a strictly random process can be avoided. Hence, Kardashev's conclusions about super civilizations enclosing galaxies are probably realistic. Indeed, when he made his proposal he couldn't have contemplated super civilizations using *Dark Energy* so commonly spoken of now. Was Kardashev's proposal too conservative?

Have we come full circle?

Carl Sagan postulated that about 50,000 years ago consciousness seemed to have emerged in our remote ancestors. He postulated that at least one of them looked up at the stars and asked, "Why am I here?" Throughout human history, *purpose of existence* has been a consistent theme among human thinkers, has been enmeshed throughout all philosophy and is central to just about every religion. Isn't it time for science and technology to shed serious light on this question? Whatever your answer, it's a great time to be here and able to witness the primitive first steps in the emergence of *space man*. There's a fantastic future for our near and distant progeny if our stored nuclear energy doesn't pull everything up short!

About the author.

EAS member Jim Scala is a biochemist by education (Columbia, Cornell and Harvard), a retired author and nutritionist by profession, and an amateur astronomer by choice. Jim's backyard observatory houses a 228-mm APO refractor where he enjoys CCD astronomy. He welcomes visitors and enjoys discussing things astronomical; especially subjects related to this article. You can contact him via e-mail at: jscala2@comcast.net and his web site is: <http://home.comcast.net/~jscala2> ★

*The Moon
October 12,
2004 at about
0700. Image
by Jim Scala.
Age is 28days,
00hours, 48
minutes old. It
is 36hours 48
minutes from
new. Or, as
some would
say 36 hours
48 minutes to
rebirth. It was
captured with
my 228-mm
refractor at
F/9 using an
ND 1 filter and
an SBIG STL
11000 CCD
camera.*



The Compass Rose Project

The primary goal of this project was to correct the long standing safety problem of having a gravel pit on the observatory plaza which people would trip in or kick up dust. In the winter this pit also became a mud pit for the joy of little kids and the horror of their parents. Terry Galloway took the initiative and replaced this eyesore/safety hazard with an attractive and functional compass rose. He did this by cutting and placing some 400 6x6" concrete pavers in a circle of red brick laid in a bed of sand and gravel. At the center is a round red stepping stone which will get a thin bronze monument to be epoxied onto the surface, providing a *very* accurate Longitude, Latitude, and Elevation. These coordinates are so accurate, they will be used to calibrate GPS devices. Extending out from this center are four arms accurately (within several millimeters) pointing to North, East, South and West. On North and South cardinal points is a bronze monument driven down into the ground for the purpose of aligning telescope mounts. Debbie Dyke used her creative artistic talent to design the compass. The last step is to stain the concrete blocks a sky blue color, to be selected by Ryan Diduck.

Terry provided the donated volunteer labor. Also donated was the USGS (and National Geographic) Surveyor, Fred Patton, who provided all of the accurate positions, orientations and directions necessary to provide an accurate compass rose.

All components of this compass rose are removable so that it can be reset in the completed observatory deck expansion as part of Measure G Building Construction, Phase 3.

The small cost to Chabot is only for the materials of construction around \$350. (See before and after pictures of the compass rose in the *Spare Shots* page [page 5].) ★

Spare Shots

▶A Chinese “konghou” harp, and twin Celtic harps in Chabot’s Music Under the Stars special musical planetarium program series. Photo by Don Saito



◀Father and daughter teamwork: he provides the push, she provides the pressure. Photo by Don Saito



◀Paul Hoy shows off the moon at the Lake Merritt Jr. Center of Art & Science. Photo by Don Saito



▲The “Gravel Pit,” which was originally a borderless planter, complete with a sprinkler system that would wet nearby telescope operators and unwary public. Photo by Carter Roberts



▲ “That Tar and Tool Guy” Mark, of the Telescope Makers’ Workshop. Photo by Don Saito

▶Terry Gallo-way almost single-handedly installed this new compass rose in Wightman Plaza which very accurately points north.



It took a tremendous amount of physical labor to haul all the bricks and sand needed to build this rose, not to mention cutting and placing them according to a pattern (designed by Debbie Dyke), and Terry pretty much did it all by himself! Photos by Conrad Jung



That’s it for this month!





Eastbay Astronomical Society

At Chabot Space & Science Center
10000 Skyline Boulevard • Oakland, CA 94619

November 2004
RETURN SERVICE REQUESTED

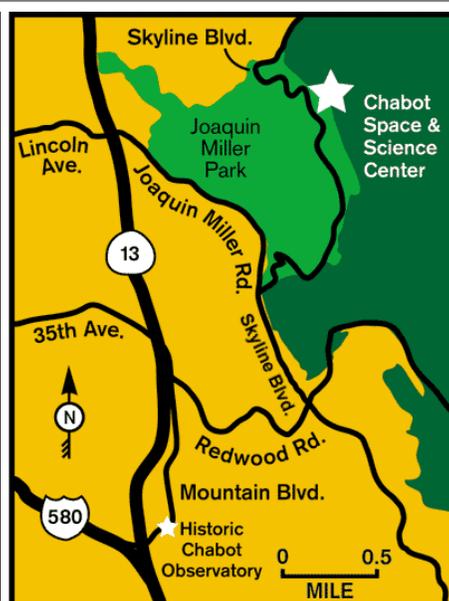
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Articles and photos for *The Refractor* are encouraged. Deadline for the November 2004 issue is October 15, 2004. Items may be submitted by mail to:
Editor - 3514 Randolph Avenue, Oakland, CA 94602-1228. Internet email address: donsaito@comcast.net Hm: (510) 482-2913.



FUTURE CONJUNCTIONS

- Nov 6 EAS General Meeting at Chabot, 7:30pm Physics Lab
- 11 EAS Board Meeting, Chabot, Soda Board Rm, 7:30pm
- 14 EAS Members Only View Night at Chabot
- Dec 12 EAS Holiday Dessert Social & View Night, Chabot,
Soda Board Rm, Spees Bldg, 6:00pm
- 9 EAS Board Meeting, Chabot, Soda Board Rm, 7:30pm

Join the Eastbay Astronomical Society

- Regular, \$24/year
- Family, \$36/year
- Contributing, \$40/year
- Student, \$15/year (digital news-letter, only)
- Sustaining, \$60/year or more

Contact: Don Stone, EAS Membership Registrar
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Sign up online at <http://www.eastbayastro.org/>