



# Comet Tails

August 2005

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**Treasure Coast Astronomical Society Membership - is that time of year again! TCAS. dues are due in September. Dues are \$20.00 per year and for that you get, this wonderful and informative newsletter each month, you also get a 10% discount on Sky & Tel and Astronomy Magazine subscriptions. The best part of being a member of TCAS is that you get to hang out with all the wonderful people that make this club so great!**

OK, for our mathematically inclined readers, here is a goodie for you. It comes from Ed Mahoney, Director of Astronomy at the Hyatt Regency Maui.

I use a 16" Meade LX 200 SC Telescope that can magnify the apparent diameter of an image as much as 800 times. If I look at Mars at this magnification, it appears to be as big as a ping-pong ball held at arms length. Now, If I view a micro photograph of sand grains on Mars taken by the Mars rovers, they appear to be similar in size to my telescopic image of Mars. My question is: Can one mathematically estimate the apparent magnification of grains of Mars sand as seen from 100 Million miles away? I'm looking for some kind of analogy like: The relative size of an ant to an Elephant.

I do have responses from on line friends and I will be sure to get them to you next month or sooner if you really want me to!

## **Editor's Stuff Patty Mayer**

It is good to be the editor!

A number of years ago while visiting New Orleans alone, I was befriended by a family who owned a sandwich shop in the French Quarter. They introduced me to many of their friends and one especially who became my personal city tour guide. His family had owned the first brewery on the river and he had just completed a beautiful home on Lake Pontchartrain. We all stayed in touch over the years, but now, I do not know. I know I am not the only one who wonders about friends in that area and feels so lost and unable to help. On page 10 is a flyer I sent out this week regarding the victims of Katrina and hope you can help. Remember, when you do give, that you know that the organization is a reputable one that will really help the people in need.

[On page 7 is a great interview with Simon Singh, author of \*The Big Bang\*, from the Universe Today web page.](#) Mr. Singh was interviewed by Fraiser Cain, webmaster of Universe Today.

**WEB LINK HIGHLIGHT**  
**John Biondo**

John sent this web site to me to use for a future newsletter and WOW, what a great site. How have we missed it for so long? At the bottom of the main page is a link to the Planet Wheel which is an interesting look at the sky.



From the web, "Welcome to *The Electronic Sky*, a site dedicated to the entire universe. The site consists of a series of articles covering a wide variety of cosmic phenomena, ranging from minor craters on the Moon to entire galaxies. *The Electronic Sky* is designed to develop and evolve, though, so at this early stage, you'll find that some entries don't yet contain much information. See the Latest Updates and Additions page to see the most complete pages."

<http://www.glyphweb.com/esky/default.htm>

**TCAS Meeting Minutes**  
**Sue Prill**

ASTRONOMY MINUTES FROM 7/26/2005

Started 7:35 and Adjourned 8:55

ATTENDANCE: 21 MEMBERS AND 8 GUESTS

**TREASURER'S REPORT:**

Treasurer is on vacation : )

**PRESIDENTS REPORT:**

PLEASE SEE THE NEWSLETTER ON OUR WEBSITE. AND PLEASE LET US KNOW IF YOU ARE NOT RECEIVING A NEWSLETTER BY EMAIL.

Talked about Deep Impact and that it made a course correction to keep the craft closer to Earth so that we can reuse it..

**NEW BUSINESS:**

November 7, 2005 we will help out a Mars Opposition viewing at IRCC. Stay tuned for more info.

Chiefland Star party is accepting reservations. The camp out is for 10/30 to 11/5 See their web site for applications.

Fred Lehman (president of the PBC club) talked to our club about doing a joint Messier Marathon camping trip in March 2006 at Kissimmee Prairie State Park.

## **OLD BUSINESS:**

Elections were held. No other person was nominated for any position. The club voted and unanimously re-elected David Brown as President, Larry Crary as Vice-President, Charlotte Bilder as Treasurer, Sue Prill as Secretary.

## **OUR MEETING:**

Larry Crary did a wonderful meeting about GAMMA RAY BURSTS and explained their strength and how to find them and how they are created. **WONDERFUL!!**

Fred Lehman also showed us some of his images from his club Website of their camping places and people.

ADJOURNED AT 8:55 PM

## **HALLSTROM PLANETARIUM Jon U. Bell, Planetarium Director**

**Indian River Community College  
Hallstrom Planetarium presents the 2005 – 2006 Starlight Series**

### **SHOW DATES**

#### **The Mars Show**

Narrated by Patrick Stewart (Captain Picard of <u>Star Trek</u> ), "The Mars Show" takes you to the Red Planet to see its great volcanos, giant canyons and barren landscapes. Discover the most earthlike of our neighbor worlds, which is also visible in our evening skies this fall.	Oct. 14 & 15 Oct. 28 & 29 Nov. 18 & 19
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#### **Star of Wonder**

Join us in our search for the star that may have guided the Magi over two thousand years ago. Find out how an astronomer might explain this great mystery. Star of Wonder has become a family holiday tradition at the Hallstrom Planetarium since 1993.	Dec. 9 & 10 Dec. 16 & 17
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#### **The Stars of the Pharaohs**

The Great Pyramid of Khufu in Gisa was built nearly five thousand years ago; like many Egyptian monuments, it's oriented to North, South, East and West. What did its builders know about the world, and about astronomy? How did ancient Egyptians regard the star-spangled sky, and how did the Pharaohs hope to reach the imperishable stars in the afterlife?	Feb. 10 & 11 Feb. 17 & 18 Apr. 7 & 8
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#### **Astronomy Day (and Night!)**

Indian River Community College and the Treasure Coast Astronomical Society will host this FREE open house. There will be telescopes, guest speakers, p.m. handouts, mini-planetarium shows, plus guided views of the sky, weather permitting.	Mar. 4 2:00 – 9:00
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## **Bear Tales and Other Grizzly Stories**

It's a camping trip under the stars as Grampa tells the family all about the bears in the sky, and how they got their long tails. Other myths and stories are told in this award-winning program about the constellations.

Apr. 21 & 22  
May 19 & 20  
June 2 & 3

**SHOWS ARE PRESENTED FRIDAYS, AT 7:00 and 8:00 p.m.  
AND SATURDAYS AT 2:00 and 3:00 p.m.**

**TICKETS FOR ALL SHOWS ON SALE NOW – ONLY \$3.00!**

Purchase in person or by phone using your VISA or MASTERCARD.  
Tickets may also be purchased 30 minutes prior to showtime depending on availability

IRCC Box Office, Main Campus, 3209 Virginia Avenue, Fort Pierce, FL 34981  
Phone (772) 462-4750 or 1-866-400-7529 toll-free from Martin, Indian River, or Okeechobee counties, Monday through Friday 11:00 a.m. - 3:00 p.m.

**For more information, call the IRCC Box Office at  
Planetarium shows are recommended for adults and children over the age of four.**

The Planetarium's air temperature is maintained at 72 degrees Fahrenheit for the benefit of the system's optics and electronics. You may wish to bring a sweater or light jacket for comfort.

**Listen to "Skywatch," hosted by IRCC Planetarium Director Jon Bell, weekdays at 7:20 a.m. and 12:59 p.m. on WQCS Radio 88.9 FM, for one-minute sky updates!**  
[www.ircc.edu/atircc/commout/planetarium/planet.html](http://www.ircc.edu/atircc/commout/planetarium/planet.html)

## **WEB PAGES Member pages**

TCAS\_ . . . . . [www.treasurecoastastronomy.org](http://www.treasurecoastastronomy.org)  
Dave Holko\_ . . . . . [www.atkmotors.com/defaultx.htm](http://www.atkmotors.com/defaultx.htm)

### Other Interesting Pages

Sky & Telescope Magazine . . . . . [www.skypub.com](http://www.skypub.com)  
Astronomy Magazine . . . . . [www.astronomy.com](http://www.astronomy.com)  
Universe Today . . . . . [www.universetoday.com](http://www.universetoday.com)  
Space news junkie . . . . . [www.space.com](http://www.space.com)  
Satellite tracking . . . . . [www.heavens-above.com](http://www.heavens-above.com)  
Free monthly sky map . . . . . [www.Skymaps.com](http://www.Skymaps.com)  
International Dark Sky Organization . . . . . [www.darksky.org](http://www.darksky.org)  
Citizens for Responsible Lighting . . . . . <http://www.crlaction.org>  
NASA . . . . . [www.NASA.gov](http://www.NASA.gov)  
Jet Propulsion Laboratory . . . . . <http://www.jpl.nasa.gov/>  
Night Sky Network . . . . . <http://nightsky.jpl.nasa.gov/index.cfm>  
Astronomy Web Guide . . . . . <http://astronomywebguide.com/index.htm>  
Lunar Picture of the Day . . . . . [www.LPOD.org](http://www.LPOD.org)



*This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.*

## **Improbable Bulls-Eye**

**by Dr. Tony Phillips**

Picture this: Eighty-eight million miles from Earth, a robot spacecraft plunges into a billowing cloud almost as wide as the planet Jupiter. It looks around. Somewhere in there, among jets of gas and dust, is an icy nugget invisible to telescopes on Earth—a 23,000 mph moving target.

The ship glides deeper into the cloud and jettisons its cargo, the “impactor.” Bulls-eye! A blinding flash, a perfect strike.

As incredible as it sounds, this really happened on the 4<sup>th</sup> of July, 2005. Gliding through the vast atmosphere of Comet Tempel 1, NASA’s Deep Impact spacecraft pinpointed the comet’s 3x7-mile wide nucleus and hit it with an 820-lb copper impactor. The resulting explosion gave scientists their first look beneath the crust of a comet.

*That’s navigation.*

Credit the JPL navigation team. By sending commands from Earth, they guided Deep Impact within sight of the comet’s core. But even greater precision would be needed to strike the comet’s spinning, oddly-shaped nucleus.

On July 3<sup>rd</sup>, a day before the strike, Deep Impact released the impactor. No dumb hunk of metal, the impactor was a spaceship in its own right, with its own camera, thrusters and computer brain. Most important of all, it had “AutoNav.”

AutoNav, short for *Autonomous Navigation*, is a computer program full of artificial intelligence. It uses a camera to see and thrusters to steer—no humans required. Keeping its “eye” on the target, AutoNav guided the impactor directly into the nucleus.

The system was developed and tested on another “Deep” spacecraft: Deep Space 1, which flew to asteroid Braille in 1999 and Comet Borrelly in 2001. The mission of Deep Space 1 was to try out a dozen new technologies, among them an ion propulsion drive, advanced solar panels and AutoNav. AutoNav worked so well it was eventually installed on Deep Impact.

“Without AutoNav, the impactor would have completely missed the nucleus,” says JPL’s Ed Riedel, who led the development of AutoNav on Deep Space 1 and helped colleague Dan Kubitschek implement it on Deep Impact.

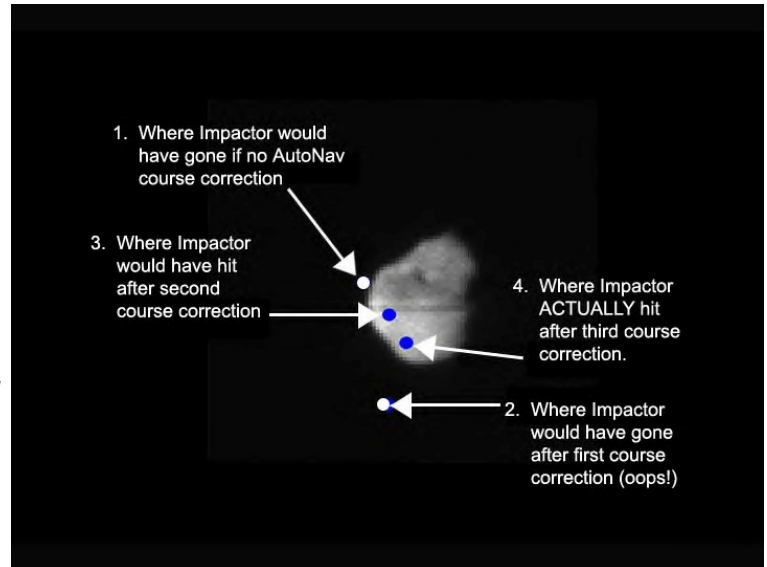
En route to the nucleus, AutoNav “executed three maneuvers to keep the impactor on course: 90, 35, and 12.5 minutes before impact,” says Riedel. The nearest human navigators were 14 light-minutes away (round trip) on Earth, too far and too slow to make those critical last-minute changes.

Having proved itself with comets, AutoNav is ready for new challenges: moons, planets, asteroids ... wherever NASA needs an improbable bulls-eye.

Dr. Marc Rayman, project manager for Deep Space 1, describes the validation performance of AutoNav in his mission log at <http://nmp.nasa.gov/ds1/arch/mrlog13.html> (also check [mrlog24.html](http://nmp.nasa.gov/ds1/arch/mrlog24.html) and the two following). Also, for junior astronomers, the Deep Impact mission is described at <http://spaceplace.nasa.gov/en/kids/deepimpact/deepimpact.shtml>

*This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.*

**Caption:**  
*Comet Tempel 1, as seen by the Deep Impact impactor's camera. Three last-minute AutoNav-controlled impact correction maneuvers enabled the Impactor to hit the bulls-eye.*



This photo is not related to the above article, but it is a shot I really like from the Deep Impact photos.



### **Moment of Impact**

A bright flash illuminates the bottom of Comet Tempel 1 after it collided with the probe from the Deep Impact spacecraft. The successful strike 83 million miles away from Earth occurred just before 2AM ET on July 4. (Univ. of MD / JPL / NASA / AP)

<http://reference.aol.com/nowyouknow/deepimpact/photos>  
461-6852

**Fraser: I just finished reading Big Bang and I really enjoyed it. How did you choose it as a subject for your next book after the Code Book?**

**Simon Singh:** I think I was in an airport lounge one day and started chatting with somebody about what do you do, and I started telling him that I was a science writer, or science communicator. We got to the subject of cosmology, and something struck me. This person was fairly intelligent and very curious about the world and yet they knew nothing about the Big Bang theory. In fact, they seemed to think that the whole thing was a fairy tale. So I started telling them about the Big Bang theory and the fact that it wasn't just a fairy tale. There's hard evidence to back it up. And I said hey, if this person doesn't know about the Big Bang theory, maybe there are lots of other people who don't know what the Big Bang theory is. That struck me as a huge shame because for years we've wondered where the Universe came from. We looked up into the sky and we wondered what was the origin of everything in being. Now we have a theory, and I just think it would be a great shame if more people didn't know what that theory is. So that was kind of the motivation for writing the book.



**Fraser: And in doing your research for the book, did you find you gained a deeper appreciation of the theory?**

**Singh:** Oh yes. My background is not in cosmology; my background is as a particle physicist. So I tend to write about things that are familiar and known to me. I'm not a mathematician, so when I wrote Fermat's Enigma I started from scratch and developed a whole new appreciation of number theory and pure mathematics. I'm not a cryptographer, so when I wrote The Code Book from scratch again, I learned about the history of cryptography and why privacy and security are so important; not just historically, but also today. As someone who really knew very little about astronomy and cosmology, it was a challenge but really rewarding to have to spend 2-3 years exploring the world of astronomy/cosmology and getting to grips with it myself.

On the one hand, that makes it tough, because I've got a huge amount of work to do. But on the positive side, I get a lot out of it. Maybe because I'm learning things for the first time, it helps me try to convey some of those difficult ideas to a more general audience. I look at people like Brian Greene. On the one hand, he's got a huge advantage of having a great understanding of his subjects - he's among the world's experts on string theory. That must help him when he writes his book, but on the other hand, it's all so familiar to him. He has to overcome the hurdle of not being blase about it; of not taking things for granted. It's an advantage and disadvantage. There are clearly writers who are researchers in the field and writers who are more generalists. I'm certainly a generalist, with a background in particle physics, not astronomy.

**Fraser: When I read Big Bang, you could really see the different pieces - the trains of evidence - all come together, and each one is quite amazing how a theorist made a prediction about perhaps what the nature of the Universe was going to be, and then the observers, in many cases found those observations to be true. The Big Bang is obviously still just a theory, like much else in science, but at the same time it almost holds a special place in scientific thinking.**

**Singh:** In a way, what the book is really about is: what is science? Fermat's Enigma is really a book about: what is mathematics? The Code Book is more generally about: what's technology? And the Big Bang is partly about... it's entirely about the Big Bang theory, but at a deeper level, it's about: what is science? How does science work? How do we know a theory is true? How is a theory developed? How is it tested? How do they turn themselves from being maverick theories into mainstream theories? That's really what I wanted to explain. The concept of paradigm shifts in science, when you have one idea - that maybe the world is flat - and then we all come to realize that the world is round. How does the community of science transform itself from having one belief to having another belief?

So that's really what the book's about. This maverick idea of the Big Bang comes along. Everybody else believes the Universe has been around forever; certainly in the science community. And over the course of half a century, there's this paradigm shift to a Universe that hasn't been here forever. One was created a finite time ago, in a very different state from the Universe we have today.

You use the expression "just a theory", and what I try to explain in the book is that everything is "just a theory". But the question is, how much evidence do you have to back up your theory? String theory is just a theory. It's very speculative, it doesn't have any evidence to back it up. The Big Bang is "just a theory", but there's a huge amount of evidence to back it up. The fact that we see the galaxies flying away from us shows us that the Universe is expanding; that it presumably started in a hot, dense compact state and then expanded outwards. The fact that we see the abundance of hydrogen and then helium in the Universe. That relative abundance can be explained by the fact that the Universe started out hot, dense, compact, and in that state there were nuclear reactions that turned hydrogen into helium, giving us the exact ratio that we have today. If there was a Big Bang, there should have been an afterglow of the Big Bang; a radiation following the moment of creation - the cosmic microwave background radiation. Sure enough we see that radiation in exactly the right wavelength you'd expect if there was a Big Bang. So, it is just a theory with a huge amount of evidence. So, that's what I'm trying to do in the book.

On the other hand, although I believe that the evidence in favour of the Big Bang is now overwhelming, and it's just accepted in the way that we accept that the continents drift around, or the same way that we believe that life developed through theory of natural selection and evolution. But there are gaps in that theory. It's incomplete. Similarly, the Big Bang theory is incomplete. It's not perfect. But on the other hand, it's clearly fundamentally and basically correct. And that's really what I wanted to stress in the book.

**Fraser:** In reading the book, I got to the end and I was actually surprised at how quickly it wrapped up. You wrapped up with the cosmic microwave background radiation, and I was kind of hoping to hear about some of the later advances about dark matter and dark energy. You really just added a few sentences at the end of the book. Why did you leave those out?

Singh: When I look around the book stores, I see lots of books that talk about dark matter and dark energy and string theory and inflation. So in a way, my book is deliberately different because it focuses on what we do know rather than what we don't know. So while most people are working at the frontiers of cosmology, on the very latest speculative research, I've said, let's look back at what we do know; let's look at the core of the Big Bang model. Let's understand who came up with that idea. How's it put forward, and pioneered, how's it tested, how do observations conflict, how did scientists resolve that conflict. As I was saying earlier, this is a

book about how science works. And so I wanted to take as a scientific theory that was well developed, and tested, rather than a part of that theory that was still being challenged, or still under debate. So the core of the book is about the history of the Big Bang and why we believe it's true. It's fairly standard science. But on the other hand it hadn't really been covered in sufficient detail for the lay reader. And then I came to the end of the book and I said, hang on, I can't just ignore that there are gaps in the Big Bang theory, that there are gaps in cosmology, so I have an epilogue where I touch on the issues of inflation and dark matter and dark energy and so on. And then it becomes a really difficult issue because a writer wants you to get to a certain point. The reader just wants to know more and more, and there are more questions that need to be answered and suddenly you run into writing dozens and dozens of pages. So, I deliberately kept it brief at the end, and pointed people towards many of those other books that cover those other frontiers of cosmology that people are working on today.

**Fraser: Right, I can imagine how just explaining any one of those topics would have kept you busy for a similarly sized book. Are there any pieces left with the Big Bang that people are working on now that maybe will fill in some outstanding pillars in the theory right now. What would you say is the big one that they're working on right now?**

Singh: For example, when I was an undergraduate, say about 20 years ago and I was doing my cosmology and astronomy courses, the question was: how does the Universe end? The assumption was that gravity would pull the Universe back, gravity would pull the galaxies back towards each other and certainly slow down the expansion of the Universe; maybe stop the expansion and maybe even cause the Universe to collapse in a Big Crunch. That was kind of the standard view. Gravity slows down the expansion, and then about a decade ago, a few observers started to try and measure that slowing down of the expansion by looking at supernovae. And the strange thing was that the Universe is not slowing down, it's actually accelerating. It's getting faster and faster and faster. There original measurements were made back around 1997. They were queried, they were made available, there were checked, they were double-checked, they were independently verified, and now it really does seem like we're in a kind of runaway universe. And if the Universe is accelerating, as well as gravity, there must be some kind of anti gravity, some kind of long range anti gravity force that's driving this expansion and that's generally known as "dark energy". So that's probably one of the greatest discoveries that have shaken the Big Bang theory, but I don't think it contradicts the Big Bang theory, I don't think it even undermines it, but it certainly highlights a lack of understanding in one part of it. So that's certainly an issue of great concern at the moment.

I remember some time ago I was traveling across North America and I was watching the Dave Letterman show and he was talking about a newspaper story in the New York Times. He opened the New York Times and he turned the pages and he eventually got to page 13 and he started telling the audience about this story that the Universe is accelerating. I think the headline was "Universe is going to rip itself apart". And he said, well, that's interesting for two reasons: first of all, the Universe is going to rip itself apart, and secondly, this is only on page 13. If this is really the case, it should be on the front page. So that's certainly one of the areas that cosmologists chat about over their coffee in the morning.

**Fraser: So I've got to know, what are you working on next?**

Singh: I'm really not sure. I think this year I'll spend a lot of time traveling, giving talks in Canada and America. I've just come back from Australia/New Zealand, Greece and Germany. And this year I'll be going to Sweden and India and so on. It takes up a huge amount of time, once the book's been published. I've just finished a theatre project, where we're giving science lectures

in a West End theatre in London, which has been a great success. But we'd originally did 9 shows with my colleague and myself Richard Wiseman, who's a psychologist. It covers biology, psychology, physics, chemistry, astronomy and it's been such a success we've extended the run. We've sold out new shows, we've sold out more shows, and that's been great fun. But also, a lot of our time's just been spent doing stuff I should have been doing for the last two or three years, but have just been too busy writing the book. Once I've cleared out my backlog, once we've finished the theatre of science, once I've finished giving talks around the world this year, next year I'll start to focus on something new. But as of yet, I'm really not sure what that'll be.

### **Katrina's Victims on the Gulf Coast**

We all remember what the storms of 2004 did to this area and our lives, we can still see blue roofs, damaged homes and businesses. We can all look back now and be thankful that the storms that hit us did not engulf us like Katrina. Our fellow US citizens along the Gulf Coast have been devastated by Katrina's fury and need our help and support.

The agencies that are helping need money donations so they can purchase what the refugees really need (Did you think we would even have so many American refugees in our own back yard?), be it food, personal toiletries, medication, etc. They have said not to send clothing and other such items to the refugees because the people do not have a place to keep it.

I want to do my part and want to encourage all of you in the legal community to help as well, so the organizations who are helping on this long and passionate road to recovery, can help the victims survive until they can once again help themselves.

Thank you for doing your part and thank you from the victims for your support and help at their time of real need. Together, we can make their lives better.

PLEASE HELP. You can send your cash donation to any of the wonderful organizations listed below - and please remember the animals that have been left stranded and homeless.

The American Red Cross  
800-435-7669  
[www.americanredcross.com](http://www.americanredcross.com)

Mercycorps  
800-852-21100  
[www.mercycorps.org](http://www.mercycorps.org)

The Salvation Army  
800-725-2769  
[www.salvationarmyusa.org](http://www.salvationarmyusa.org)

ASPCA  
866-275-3923  
[www.aspca.org](http://www.aspca.org)

Feed the Children  
800-525-7575  
[www.feedthechildren.org](http://www.feedthechildren.org)

Humane Society  
888-259-5431  
[www.hsus.org](http://www.hsus.org)

America's Second Harvest  
877-817-2307  
[www.secondharvest.org](http://www.secondharvest.org)

Habitat for Humanity  
866-292-7892  
[www.habitat.org](http://www.habitat.org)

