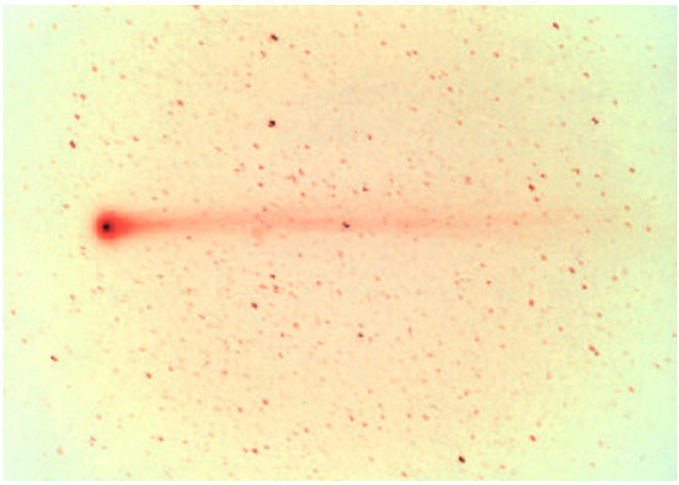
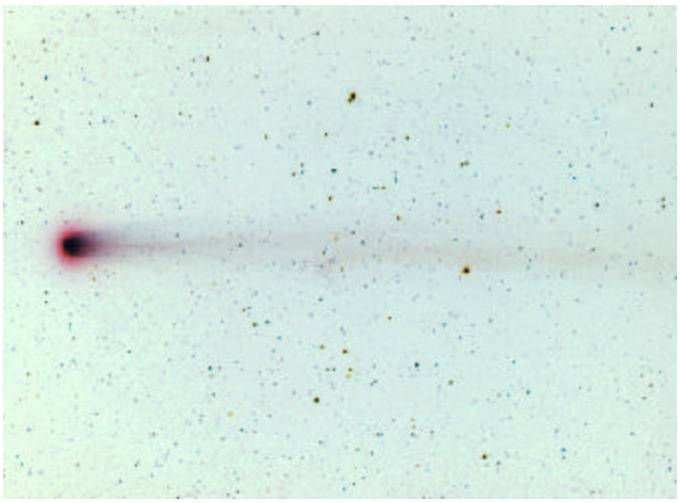
Regulus

Newsletter of the RASC Kingston Centre Issue 96-03 May/June 1996

Comet Hyakutake



While everyone was preparing for the "comet of the century" Hale Bopp, the solar system threw a curve at us and tossed in a fabulous comet, Hyakutake. This comet put on an excellent showing at the end of March and most of April as it raced from the stars of Libra, through Ursa Major, right by Polaris and then down off through Perseus towards its perihelion passage on May first. Observers from dark skies reported tail lengths in excess of 70 degrees. Even from our moderately light polluted location, a tail of 50 degrees was visible to the naked eye. This comet was easy to photograph. Usually comets are tough to find and even prime focus shots are faint disappointing fuzzy blurs at best. These two pictures are scans of photographs taken with ordinary camera lenses, the film used was Kodak Royal Gold 400 and the pictures were taken on March 25th while the comet was going through then end of the handle of the Big Dipper in Ursa Major. The first picture was taken using a 50mm f1.2 lens stopped down to f2. The exposure was 16 minutes long and a Celestron Light Pollution Reduction filter was put in front of the lens to bring out details. The camera was mounted on our 13cm f8 refractor and the telescope was guided on the comet's nucleus.



The second photograph was taken using an 80mm f2.8 lens. The exposure was for eight minutes, wide open. Notice the knot in the tail right beside M101. M51 is also visible further down the tail. The comet has now left our skies to reappear in the Southern hemisphere. I hope that they are blessed with views like we saw. Comet Hale Bopp is going to be quite nearly in the same part of our skies next spring as Hyakutake was this spring. Are people going to start expecting a bright comet to be in the north western sky each spring from now on? Clear skies! Mark Kaye from out Calgary Way

In This Issue

Some of the articles in this issue are in reduced type. We received so many submissions that some also had to be cut!

The Centre

The Newsletter of the Kingston Centre of the Royal Astronomical Society of Canada

Newsletter Submission Info:
Deadline is the Friday before regular meetings in odd numbered months.
email: ***kell@cliff.path.queensu.ca***
Fax: 1-613-545-2907 (with cover page to Kevin Kell)
Post: Box 2033 Kingston Ontario K7L5J8 Canada
ascii or most major word processors (WP6.1 for windows preferred) via email or 3.5" DOS floppy disk

Our Web page can be found at:
http://crp.kingston.on.ca/rasc/rasc.htm

Officers and Executive Council

President:	Peggy Torney
Vice President:	David Stokes
Secretary:	John Baker ***b***
Treasurer:	Kim Hay
Editor:	Kevin Kell
National Council Rep:	Cathy Hall
Alternate Rep:	Kim Hay
Librarian:	Kevin Kell
Honourary President:	David Levy

To Send email to all members of the Kingston Executive, address it to: ***rascexec@cliff.path.queensu.ca***

Committee Chairs

Astronomy Day:	Cathy Hall	613-
Education:	Kim Hay	613-
Publicity:	Christine Kulyk	613-
Observing:	Peggy Torney	613-
Light Pollution:	John Baker	
GA:	Peggy Torney	613-

Centre Address
RASC - Kingston Centre, PO Box 1793, Kingston, Ontario
K7L 5J6 Canada

Upcoming Meetings

May 9th: Members night & GA Committee Presentation
June 14th: Regular Meeting TBA
June 27-July 1st: 1996 General Assembly in Edmonton
July 12th: Regular Meeting Speaker: Gregory Schmidt, NASA employee
August 9th: Regular Meeting
September 13th: Regular Meeting
October 11th: Annual General Meeting & '97 Elections
November 8th: Regular Meeting
December 13th: Annual Awards Dinner & Meeting

Regular Meetings of the Kingston Centre are held on the 2nd Friday of each month (unless noted otherwise) at 20:00 local time in **Room B-201, Mackintosh-Corry Hall** at Queen's University (parking available off Union Street at Frontenac).

Special Events:

June 22-23: Trenton International Air Show The Belleville Astronomy Club, joint with R.A.S.C. Kingston, will be hosting an astronomy display on Saturday June 22nd and Sunday June 23rd, at theTrenton International Air Show. We will have displays, photographs, handout information for the public, and lots of telescopes. Members are encouraged to participate! Those helping out will be provided with passes for the air show, and preferential parking. The attendance for this event is estimated at over 75,000 people. The organizer for this joint astronomy display is Joe Shields, 613-xxx-xxxx. Give him a call, and come out and participate!Help the public learn that there's more above the clouds than just planes....!

August 9-12: StarFest '96. The Annual North York Astronomical Association Star Party at Mt. Forest.
Monday August 19th: Terry Dickinson's Charleston Lake Provincial Park Lecture & Observing Session

From The Editor

We received only a couple of **Edmonton GA registration forms** and so far it seems none of the members who attended last year's GA in Windsor have received any either. I have made up about 25 copies which will be available at the next Kingston Centre meeting. Putting on my **Librarian Hat** for a moment, I have completed a major project in the bundling of our collection of astronomy related newsletters and these will be made available for signout at the May meeting. There is some really fascinating stuff in the newsletters from other centres... and even *I* don't get a chance to read through them all.

From the Prez

submitted by Peggy Torney

It's time again for my report. This edition is a triple header. You get my report as President, as Chairperson of the General Assembly Committee and I represented Kingston at the last National Council meeting. Since the editor of Regulus says that we are short on space, I'll be brief.

President's report: congratulations from the Centre are extended to one of our younger members, Kendra Angle for her Science Fair project. This was awarded the RASC prize which the Centre donated to the Fair and was presented by Brenda Smith.
Last month's meeting, held at Grant Hall with Dr. David Levy as speaker went very well. I would like to personally thank all those who helped calm my stage fright (I think you know who you are). There was a great deal of interest expressed in the Society as a result of that lecture. Next month is my turn, I guess (unless someone else wants to present)? We have Gregory Schmidt tentatively booked for July. Mr. Schmidt is a NASA employee who has been working on shuttle and space station projects. He has just been accepted in Berkeley to work on his doctorate and he will continue to work for NASA. Greg is also an amateur astronomer (Denise and I met him at Stellafane last year) and collector of antique telescopes.

GA COMMITTEE REPORT
We have had a couple of meetings this year. At our last meeting, held April 13th at my home, we chose our Ruth Northcott Memorial Speaker. This person has been asked and has accepted our invitation. I will withhold the name until after the General Assembly at Edmonton --- but it is a 'goodie'. We are also in the process of putting together the display board to advertise our GA in Edmonton. If you have any photos or posters of some of the sights around Kingston, astronomical or otherwise, that you would like to loan us, please contact me.

And finally, **National Council Rep report**: This meeting was held on March 23rd in Toronto. A lot happened during the meeting but I'll try to hit the highlights. First a new Centre was welcomed, the Okanagan Centre with Ron Bell as President. There are plans to change the way you pay your membership and how you will receive your publications. It was agreed in principle that negotiations with the University of Toronto Press should be carried out with the final decision to be made at the NC meeting in July. Also decisions were made concerning the retirement of Rosemary Freeman. There will be a presentation made to Rosemary at the Edmonton GA and anyone wishing to contribute to gifts may do so through Doug Hube. Three Messier certificates were presented: Glenn Hawley, Alfred Connelly and Rose Marie Eklind.

Next year, starting with the January Edition, you will be receiving a subscription to "SkyNews" (the new Canadian publication that Terry Dickinson edits) along with your membership. There will be no additional charge and it is on a one year trial basis. The RASC will receive ½ page of advertising space is each edition. You will also be receiving a new publication next year, to replace the existing Bulletin and Journal, but the final name will not be decided until the July NC meeting. The motion as it presently stands is for a "poetic" name not an "industrial" name.

It was a long meeting and a lot of ground was covered. There will be many changes taking place in our National Council and by extension, all our centres over the next few years. There is an election this year, to be held at the GA, and as you can read, several items were tabled to that meeting. If you can, go to the GA and make yourself heard at the General Meeting. If you can't, make sure that your Centre Rep, Cathy Hall, or someone else that you know, trust and is attending, understands your preferences and has your proxy. This is your Society and only by making yourself heard can it remain so.

National News

Report of the Computer Use Committee of the "Royal Astronomical Society of Canada" 21 March 1996. Since my last report, I have been working in three areas: 1. Continued additions to the National Internet WWW Site (***http://apwww.stmarys.ca/rasc/nat/rasc.html***)

In addition to making the minutes of the last meeting available, I have converted the agenda and most of the reports of officers and committees for this meeting into WWW format and placed them on the site as soon as they were available. We are now receiving

more than 500 accesses per month and this is likely to grow with time. Fourteen of the 23 Centres now have their own WWW pages "linked" at the national site. If your Centre is not listed, let me know.

I have found "free" software which will allow the contents of the RASC Manual easily converted to WWW format. I expect to have most of the Manual on-line before the next meeting. Walter MacDonald has also provided some pages of information about the National Library, however, I haven't as yet made time to put them on-line.

2. Internet E-mail mailing lists.

The "RASC Discussion List," first announced at the last meeting, has taken on a life of its own. There are currently about 70 members with an average message traffic of about 10 messages per day on all sorts of topics including national RASC politics, observing (including Comet Hyakutake), and general discussion between members from all across the country. The only thing I would like to see change would be to have more active participation from the National Council members. To "subscribe" to the Discussion List, send a message to: "***listserver@astrotech.stmarys.ca***" with the first line of your message being similar to: "subscribe rasclist David Lane (Halifax Centre)" (without the quotes). You will then be sent a message containing instructions on how to use the list.

In order to streamline the communication of national business, I have created three mailing lists as follows. Sending a message any of these addresses will cause your message to be "bounced" to all those on the list.

executive@astrotech.stmarys.ca - sends all members of the executive committee

council@astrotech.stmarys.ca - sends to all elected and appointed members of council including the executive committee (not including the centres)

centres@astrotech.stmary.ca - sends to all known addresses of Centre council members and/or Centre e-mail addresses

As a result of these lists, you will no longer need to maintain your own lists of e-mail addresses for the centres. As long as I am notified of changes, it will remain up-to-date.

3. Need an E-Mail address?

I have created a means to obtain the current list of known e-mail address of RASC Council, Centre, and members. Just send a message to "***addresses@astrotech.stmarys.ca***" and the current list of e-mail addresses will be "mailed" back to you.

On behalf of the committee,
David J. Lane, Chair, Computer Use Committee
E-Mail: ***dlane@ap.stmarys.ca***

Astronomy Day

Saturday April 20, 1996
Coordinator: Cathy Hall
by Kevin Kell & Cathy Hall

International Astronomy Day, Saturday April 20th, has come and gone, and all in all (considering the clouds, rain, thunder and lightning) it was great! The public perception and (what's that advertising term for visibility?) awareness was very high leading up to this event, mainly it seems from the current comet visitation we were having (no, really? - CH :)

The Cataraqui Town Centre actually moved us at the last minute to a larger display area, due to the number of inquiries they were receiving from the public, we expect due to the radio station announcements of our activities. We arrived about an hour and a half before the mall opened, and set up our easels with posters mounted on foamcore (some really nice posters...from the National Museum of Science and Technology in Ottawa, and a small store in Belleville, Ontario called My Science Project). We also had a number of tables, two of which were devoted to Leo Enright's incredible photographs, the Beginners Observing Guide, and an Edmond Astroscan tabletop telescope.

Two larger telescopes, the club's 10" Dobsonian and Laura Gagne's 8" Celestron, were also set up, and used for demo purposes (ever see a ceiling mounted fire sprinkler from 100m away?). One of the highlights for smaller visitors was Laura Gagne's astronomy quiz board, an electric board with buzzer with a whole bunch of questions and answers. The buzzer sounded if the kids (or adults) got the right answer. And - we were deluged with kids....it was great!

We had a number of boxes of wonderful handout brochures - "Getting Started in Astronomy" from Sky & Telescope magazine, and "Welcome to Amateur Astronomy" from Astronomy magazine. Terry Dickinson provided back issues of SkyNews magazine, which were very popular as well. We also gave out special information brochures on R.A.S.C. Kingston, with details on our meetings and activities.

There was a steady stream of people to see the displays, and a very good percentage stopped and actually asked questions (a very good sign of interest!).

One gentleman asked us to recommend a good beginners book on astronomy. We recommended Terry Dickinson's new book, "Summer Stargazing". The gentleman reappeared about half an hour later, a purchased book in hand, to make sure that he got the right one! A number of our members came by to visit and see the displays as well, including Hein van Asperen and his wife, and Peter Kirk.

The planned evening program, a joint observing session with the Queen's University Astronomy Group, was unfortunately rained and hailed out. They had hoped to open the University's Ellis Hall Observatory, and show the sky to the public with their 15 inch reflecting telescope. The R.A.S.C. members had also hoped to be able to set up a number of scopes nearby.

Many thanks are due for the wonderful success (in spite of the weather) of our R.A.S.C. Kingston Astronomy Day this year: - to Dr. Judy Irwin of Queen's University, who helped out with the mall display when it looked like the observing

would be rained out... - to Kathy Perrett of Queen's, who showed up for the evening session - just in case someone was out in spite of the lightning... - to Sherri Haigh of the Cataraqui Town Centre, who was more than helpful getting us organized at the mall - to Terry Dickinson, for providing back issues of SkyNews for the public - they loved them... - to Sky & Telescope magazine, for providing hundreds of their "Getting Started in Astronomy" brochures, shipped Fedex to our door... - to Astronomy magazine, for providing (again) hundreds of brochures, "Welcome to Amateur Astronomy" - to Christine Kulyk, for help at the mall, and with media coverage - to Leo Enright, for his wonderful photographic displays, and his expertise in fielding some of the more challenging questions we were asked ... - to Laura Gagne, for her wonderful electric quiz board, and for demonstrating the use of her telescope all day...her husband and children provided great support too... - to Tom Dean, for demonstrating the club's Dobsonian, and making sure the kids didn't fall in... - to Kim Hay, who manned :) the mall display in spite of her recovery from strep throat - to Dieter Brueckner and family for coming by to help at the display - to Ruth Hicks for helping at the display, and providing a wonderful dinner for the out-of-towners at the end of the day! - to Peggy Torney and her school in Sharbot Lake for providing the loan of the easels - to Ian Levstein, for helping at the display, and demonstrating that adults, too, could get the answers right on the astronomy quiz board :) - to Jim Towgood, who had offered his telescope, but had to cancel due to medical reasons (get well soon!) - and last but not least, thanks - to Kevin Kell, for providing accommodation for your R.A.S.C. Kingston Astronomy Day coordinator (who lives in Ottawa :), for folding over 300 R.A.S.C. information brochures, for carrying all the heavy stuff (the club scope and the easels) for setup in the mall, and for all his support on any last minute projects that needed to be done - and to Cathy Hall, your Astronomy Day coordinator, who likes to make things happen!

General Submissions

"Kingston Centre encourages its members to write in with news of astronomy in their area and/or updates on their recent observations..."

It's Nice *submitted by Laura Gagné*

It was a warm spring evening, not too long ago, when I took my telescope out to the park to observe the wonders of the night sky. Everything was perfect. There wasn't a cloud in the sky and there was no wind. A few people lingered in small clusters, chatting and enjoying the beautiful weather. A jogger ran along one of the meandering footpaths that intertwined along the fresh green grass. Robins sang to each other across the park as the sun began to set. I began to assemble the telescope. A few curious people glanced periodically in my direction, no doubt trying to guess what I was doing. Before long, one of them approached me.

He was fairly tall, at least from my point of view and he had a professional air about him. He seemed well educated and I could see the curiosity in his eyes as he drew near. I introduced myself and explained that I was an amateur astronomer and I planned to try to locate some distant galaxies and star clusters that are sometimes hard to find. He seemed to be very interested in my telescope, asking questions about the cost and "power" of it. To him I suppose, the more expensive and "powerful" it is, the better it must be. I didn't try to explain things like aperture and focal length. I simply offered to give him a demonstration. He accepted, though I could sense an undercurrent of testing on his part, as if my telescope and I were on trial. I knew I had to find something impressive to the untrained eye. Andromeda was my first thought.

I quickly located the Andromeda galaxy, my personal favourite. I enthusiastically explained to my new friend that the Andromeda galaxy is much like our own Milky Way galaxy, but is about one and a half times larger. I told him that it contains billions of stars like our sun, all rotating around what might be a black hole. I warned him that all we see from our distant viewpoint is a bright cloud, but it really is made of stars. He stepped up to the eyepiece. I held my breath. This was the test. Would he be impressed? How could he not be? He looked. Seconds passed and I wondered if he could see it at all. He turned to me and said "It's nice". Nice! What kind of description is that for something so compelling and fascinating? My heart sank.

As he walked away I wondered how he could have missed that which I treasure so much. Did he not understand that the Andromeda galaxy is so very far away, and yet the photons born deep with its stars still manage to travel several light-years through space to reach their final destination deep within our eyes? Did he not wonder if the Centre of the galaxy really could contain a voracious, menacing black hole devouring everything that comes too close? Did he hear me tell him of the billions of stars like our sun that make up the Andromeda galaxy and wonder if maybe there could be a planet like ours orbiting one of them? Perhaps on one such planet a fellow amateur astronomer has set up her telescope in the park and is right now showing a curious bystander our galaxy and telling him the same things I told my friend. I wonder if that alien observer can find a better adjective than "nice" to describe all that we hold so close to our hearts and consider arrogantly to be unique in all the universe.

I forgive the uncomprehending souls for their lack of enthusiasm. I do wonder though, what it is that makes some of us stand awestruck at the eyepiece while others remain so passive as they take a quick peek and move on. I wonder how I can feel such ecstasy, completely absorbed by the majestic splendors of the universe, while some people never even bother to look up on a clear night. Most of all, though, I wonder how I might transmit some small part of the joy I feel to someone else. It would be wonderful if everyone could experience the wonder and enchantment of a velvet black, diamond-encrusted night sky.

Clear Skies, Laura Gagné

COMET HYAKUTAKE *submitted by Hein van Asperen*

The April issue of SKY & TELESCOPE showed the path of comet Hyakutake (C/1996 B2) which was very similar to the map in the March/April Regulus, but luckily Regulus also listed the coordinates of the comet. Because I live close to an industrial park with an abundance of artificial lights, many of the

various constellations are difficult to see. I go by RA and DEC and convert these values into Azimuth and Altitude.

I wrote a short article for the local newspaper (The Recorder and Times) to tell the Brockvillians where to look. After explaining the meaning of the terms Azimuth and Altitude the reader could find the comet with the help of a graph showing the position of the comet in the sky, expressed in these terms.

My first observation of the comet was on March 18, 22:30 local time with binoculars. It was a fuzzy spot, the comet was low in the east and I did not see a tail. Then came a number of cloudy evenings. My next chance was on March 23 and with binoculars a small tail was visible.

The clouds returned but on the evening of March 25 there were some openings in the cloud cover and I viewed comet Hyakutake for a few moments with the naked eye and with binoculars. Later in the night, it was meanwhile March 26, the sky became clear. The comet was very bright and showed a nice tail. At 00:50 I tried to make a photo of the comet but after 2 minutes the clouds returned. Still I had a negative, a comet with a small tail. The next night (still March 26) the sky was clear and I could make a photo with a 200 mm lens and a 10 minutes exposure on Ilford 125 ASA. The print showed a large comet head with pronounced tail. When printing in underexposed mode the size of the comet head was as large as the full moon when photographed with the same lens and enlarged to the same scale. According to the table in Regulus the Geodistance was .116 AU while The Observer's Handbook lists the average Earth-Moon distance as 384500 km or 2570*10-6 AU. The gas and dust envelope around the comet head must then be roughly .116 1 2570*10-6 = 45 times as large as the Moon. Quite a size!

The following nights the sky cooperated and I could observe the comet on five consecutive evenings. Moonlight interfered but the comet was visible with the naked eye and with binoculars the tail was pronounced. On March 30, I tried to observe with my 8-inch telescope. The comet head was beautiful with a sharp white spot in the center but the tail was difficult to see. The next chance was on April 2. Then came April 3, with the Moon in eclipse. With the moon out of the way the comet was clearly visible with the naked eye and the tail with binoculars. On April 4, 5, 9, 12 and 14 the comet was in Perseus.

The night of April 12 was particularly impressive. The comet head was between Algol and Perseus 22 while with binoculars the tail could be followed to Perseus 37 and 39. The coordinates of the head were RA 3h4min and DEC 40 degrees and of the tail-end RA 3h40min and DEC 48 degrees. Using the same equation as is used to calculate the Great Circle Distance on the Earth, the length of the tail was 10.28 degrees. At that moment the comet was .526 AU from the Earth. The length of the tail is then (.526*3.1416*10.28) /180= .094 AU. Actually at that moment the direction Earth-comet is at an angle of approximately 110 degrees to the angle Sun-comet and the tail is even longer, by my estimate approximately l AU. This is quite a comet!

Since April 14, all evenings were cloudy and the forecast for the coming days is just as bad. The comet is soon below the horizon by the time the sky darkens enough to observe (21:30) and I doubt if I ever see comet Hyakutake ever again. I am looking forward to comet Hale-Bopp and I hope that Regulus prints a similar listing for that comet.

Heinz van Asperen, Brockville, Ont.

Contract Position at RMC

(dated 1996 March). A position is available immediately for work at the Military College Observatory, in Kingston, Ontario, to bring the facility to an operational standard. The main instrument is a 24" reflecting telescope. The estimated time of contract completion is six months. Applicants must possess a sound knowledge of motor operated system, and skills in drafting, computer programming, and interfacing of mechanical devices. For more info contact Captain Harold Kenny, Physics, RMC, Kingston, Ontario K7K 5L0 voice: 613-541-6000 ext 6042, fax 613-541-6040, email: ***kenny-h@rmc.ca***

Telescope status

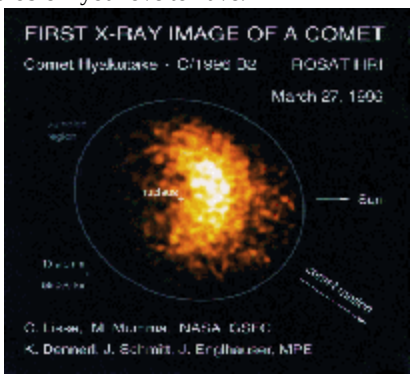
The telescope was last seen after Astronomy day, in the care of Theo. The Binoculars are out with Janis.

"Veni, vicidobsonus, vidi..."
(I came, I got a large aperture Dobsonian, I saw...)

Internet Tidbits

April 4, 1996 RELEASE: 96-66
First X-Rays from a Comet Discovered

A team of U.S. and German astrophysicists have made the first ever detection of X-rays coming from a comet. The discovery of a strong radiation signal -- about 100 times brighter than even the most optimistic predictions -- was made March 27, 1996, during observations of comet Hyakutake using Germany's orbiting ROSAT satellite. The strength and rapid changes in intensity of the comet's X-ray emission both surprised and puzzled astronomers. "We had no clear expectation that comets shine in X-rays," said Dr. Michael J. Mumma of NASA's Goddard Space Flight Center, Greenbelt, MD. "Now we have our work cut out for us in explaining these data, but that's the kind of problem you love to have."



The image also is available on the Internet at URLs:

http://heasarc.gsfc.nasa.gov/docs/rosat/hyakutake.html

March 20, 1996 RELEASE: 96-55
Chain of Impact Craters Suggested by Spaceborne Radar Images

A team of scientists believes they have discovered a chain of impact craters in the central African country of Chad that suggests ancient Earth may have been hit by a large, fragmented comet or asteroid similar to the Shoemaker-Levy 9 comet that slammed into Jupiter in 1994.

The craters were discovered in radar images of the Earth taken by the Spaceborne Imaging Radar C/X-band Synthetic Aperture Radar (SIR-C/X-SAR)

that flew on the Space Shuttle Endeavour in April and October of 1994. The images reveal two new craters adjacent to a previously known impact site, called Aorounga, in northern Chad. The two new craters still need to be confirmed by fieldwork on the ground.

March 18, 1996 RELEASE: 96-54
Galileo Scientists Report Changing Findings about Jupiter

Scientists continuing to analyze information returned by the Galileo atmospheric probe that plunged into Jupiter last December report more surprises about the giant gas planet.

Most significantly, the ratio of the elements that make up 99 percent of the Jovian atmosphere -- helium and hydrogen -- now closely matches that found in the Sun, suggesting that
Jupiter's bulk composition has not changed since the planet formed several billion years ago. Estimated amounts of key heavy elements such as carbon and sulfur have increased, but
minimal organic compounds were detected, and estimates for Jupiter's wind speeds have climbed still higher.

"This then confirms that Jupiter is much hotter in its interior than its neighbor Saturn, the next largest planet in the Solar System. It also may force scientists to revise their projections for the size of the rocky core believed to exist deep in the center of Jupiter," he said.

Further analysis of probe data has confirmed the preliminary report that the Jovian atmosphere appears to be relatively dry, with much less water than anticipated on the basis of solar composition and predictions from data sent by the Voyager spacecraft that flew by Jupiter in 1979. These studies predicted a water abundance for the planet of twice the solar level (based on the Sun's oxygen content.) Actual probe measurements now suggest an amount of water less than that of
the Sun.

The Galileo orbiter is beginning a two-year, 11-orbit tour of Jupiter and will have its first major encounter with a Jovian moon on June 27 when it flies closely by Ganymede. The orbiter successfully conducted a key engine burn on March 14 to prepare for this encounter.

Space Calendar

The Space Calendar covers space-related activities and anniversaries for the coming year. This Calendar is compiled and maintained by Ron Baalke. Please send any updates or corrections to ***baalke@kelvin.jpl.nasa.gov***

You can find this on the web at:
http://newproducts.jpl.nasa.gov/calendar

This Month in Space History - May 1996

May 01 - Comet C/1996 B2 (Hyakutake) Perihelion (0.230 AU)
May 04 - Venus At Greatest Brillancy (Magnitude -4.5)
May 05 - Eta Aquarids Meteor Shower
May 07 - Asteroid Vesta at Opposition
May 08 - Lunar Occultation of Comet Hale-Bopp
May 12 - Comet West-Hartley Perihelion (2.13 AU)
May 18 - Asteroid 1991 JR, Near-Earth Flyby (0.1087 AU)
May 22 - Pluto at Opposition
May 22 - Asteroid Parthenope at Opposition
May 29 - Asteroid Ceres at Opposition

June 1996

Jun 01 - Moon Passes 0.8 Deg North of Asteroid Ceres
Jun 03 - Comet Gunn, Closest Approach to Earth (1.469 AU)
Jun 06 - Comet Hyakutake Crosses the Earth's Orbit
Jun 07-08 - Kuiper Belt Workshop, Toronto
Jun 10 - Mercury At Its Greatest Elongation (24 Deg)
Jun 11 - Asteroid 1566 Icarus Near-Earth Flyby (0.1012 AU)
Jun 14 - Mercury Passes 3 Deg South of Mars
Jun 16 - Asteroid 1990MU Near-Earth Flyby (0.2499 AU)
Jun 16 - Mars Passes 3 Deg NW of Mercury
Jun 20 - Summer Solstice
Jun 23 - Mercury Passes 1.5 Deg North of Venus
Jun 25 - Comet Parker-Hartley Perihelion (3.05 AU)
Jun 28 - Galileo, Europa Close Approach (Orbit 1)
Jun 29 - Asteroid Metis at Opposition

July 1996

Jul 02 - Comet Kopff Perihelion (1.5796 AU)
Jul 03-05 - International Conference on the SL9-Jupiter Collision, Meudon, France
Jul 04 - Jupiter at Opposition
Jul 05 - Earth at Aphelion (94,509,780 miles from Sun)

Buy, Sell & Trade

For Sale: 60mm, f15 Tasco refractor (approx 40 years old), includes equatorial mount, wooden tripod, several lenses, wooden carrying case. Call Wally Beaupre at 546-1531 to make him an offer.

Free to a Good Home: approx 20 years of Astronomy magazines (almost a complete set) from 1975-1995. Contact Arlow Anderson at 613-335-2389. Located at RR #3 Mountain Grove (west of Sharbot Lake)

RASC Promotional Items For Sale:
Items in stock: (Prices and shipping costs)
✯ RASC lapel pins (blue, white & silver)$4.00 each (+$1.00 shipping)
✯RASC stickers (blue with white overlay)$1.25 each (add $0.50 shipping per order)
✯Golf shirts (white,sm,med) lt blue (med) $20.00 each ($4.00 shipping)
✯Toques (Black with Yellow writing)$15.00 each ($2.00 shipping)
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All taxes included in prices. If at anytime you have questions or future ideas for RASC Promotions please contact me with the address below.
Mail: Mrs. Kim Hay, RR#2 , Perth Road, Ontario, K0H 2L0, Canada
phone: 613-353-1189 email: ***Kim.Hay@moonlight.crp.kingston.on.ca***
Check out the Kingston Centre WWW Home Page for pictures of the items mentioned above!
Please make Canadian cheques and Money Orders payable to : Royal Astronomical Society of Canada (RASC)

Library Inventory

This is the long-promised annual library list. A reminder that we are always looking for donations of new books (preferably newer than older!)

, (1986). **Circumstellar Material - Late-Type Stars.** Proceedings of the Dunsink Bicentenary Symposium, Dublin 3-6 Sep. 1985, Dublin, Ireland. *Studies related to gas, dust and probable magnetic fields surrounding cool stars are reported..*

Abell, George, (1964). Exploration of the Universe, Second Edition. Holt, Rinehart and Winston, New York, USA. *An introductory textbook of astronomy for readers without special training in science or mathematics.*

Allen. The Eternal Universe

Aventi. **Conversing with the Planets**

Baker, Robert H, (1964). **Astronomy; 8th Edition**. D Van Nostrand Co, Princeton, USA. *A textbook for two-semester introductory courses in astronomy at university level.*

Binzel, Richard P, and Matthews, Mildred

Shapely, (1989). Asteroids II. The University of Arizona Press, Tucson. *More than a sequel to Asteroids published in 1979, this book is a new treatment intended to stand on its own as a complete description of the current understanding of the field. All chapters are written at the graduate student level..*

Birney, D Scott, (1974). Modern Astronomy. 2nd Edition. Allyn and Bacon, Inc, Boston, USA. *An introductory textbook.*

Brandt, John C, and Maran, Stephen P, (1972). New Horizons in Astronomy; Sample Chapters. W H Freeman and Co., San Francisco, USA. *The textbook is written for a short survey course in astronomy for non-science majors.*

Brashear, John A, (1988). **A Man who loved the stars - An Autobiography**. University of Pittsburgh Press, Pittsburgh, USA. *This is the story of a simple millwright whose hobby driven by his genius turned him into an internationally renown astronomer.*

Burnham, Robert Jr. (1978). Burnhams Celestial Handbook: An Observer's Guide to the Universe Beyond the Solar System (Hardcover) by Robert Burnham Jr. Vols 1, 2 3

Clotfelter, Beryl E, (1976). Instructor's Manual to Accompany the Universe and its Structure. McGraw-Hill Book Co, New York, USA. *The teacher's guide includes pedagogical suggestions, description of a highly recommended demonstration, literature references, and sample examination questions..*

Covington, Arthur R, (1979). Historical Background for the 1970 Absolute Calibration of Solar Flux. Herzberg Institute for Astrophysics, Ottawa, Canada. *Developments leading up to the 1970 redetermination of the absolute flux at Goth Hill with a 4x3 ft. aperture pyramidal horn are reviewed..*

Davies, Paul, (1978). The Runaway Universe. Harper & Row, New York, USA. *From the primeval fire and the big bang that generated space and time, the universe has been moving gradually toward disintegration and the ultimate catastrophe. The sun will burn out, the galaxies will turn into giant graveyards, and space-time will be overwhelmed as black holes swallow up whole stars and star systems and coalesce to form superholes..*

Davies, Paul. God and the New Physics

Davies, Paul, (1981). The Edge of Infinity. Simon and Schuster, New York, USA. *The author charts the route to the physics of the future, which lies beyond the edge of infinity. At the so-called singularities, regions of overwhelmingly strong gravity, all physical laws and structures break down, spacetime is ripped open and matter may enter or leave the physical universe. Singularities lie at the centres of black holes and mark the and destruction of the universe.*

Dickinson, Terence, (1991). Backyard Astronomer's Guide. Camden House Press, Camden East.

Dickinson, Terence, (1993). From the Big Bang to Planet X Camden House Press, Camden East.

Dickinson, Terence, (19). Telescope Buyers/Owners Guide

Dixon, Robert A, (1975). Teacher's Manual for Dynamic Astronomy; Second Edition. Prentice-Hall, Inc, Englewood Cliffs, USA. *The teacher's guide includes suggestions for the course, literature references, notes by chapters, answers to questions in the text and a comprehensive examination..*

Dotto. The Astronauts

Duffett-Smith. Practical Astronomy on your Calculator

Edberg, Stephen J, and Levy, David H, (1985). Observe - Comets. Guide to Cometary Studies. Astronomical League, Washington, USA. *Projects and methods for both novice observers and advanced practitioners are described for observing equipment that ranges from unaided eye to a 16-inch telescope..*

Field, George, and Verschuur, Gerrit, (1978). Cosmic Evolution: an Introduction to Astronomy. Houghton Mifflin Co., Boston, USA. *The goal of this textbook is to convey qualitatively what is known about the evolution of the universe and its contents from the chaos of the primordial big bang to the current phase, in which intelligent life is emerging.*

Hawking, Stephen. A Brief History of Time & Space

Hodge, Paul, (1966). The Physics and Astronomy of Galaxies and Cosmology. McGraw-hill book co., New York, USA. *The nature, evolution and properties of galaxies is covered and related to the general understanding of the universe. Essentially non-mathematical..*

Jarrell, Richard A, (1988). The Cold Light of Dawn. University of Toronto Press, Toronto, Canada. *The author traces the evolution of Astronomy in Canada with emphasis on the social and institutional history..*

Jastrow, Robert, and Thompson, Malcom H, (1972). Astronomy: Fundamentals and Frontiers. John Wiley & Sons, New York, USA. *An introduction to astronomy, the subject is approached from the point of view of evolution of galaxies in time. If follows events that led from the explosive beginnings of the universe through the birth of innumerable stars and planets including the sun and the earth.*

Johnson, Martin, (1959). Astronomy of Stellar Energy and Decay. Dover Publications Inc, New York, USA. *A general reader's outline of facts and theories about the life-history of stars, and a student's introduction to their radiation, steady or varying or catastrophic.*

Kellerman, K, and Sheets, B, (1983). Serendipitous Discoveries in Radio Astronomy. National Radio Astronomy Observatory, Green Bank, USA. *Honouring the 50th anniversary announcing the discovery of cosmic radio waves by Karl G. Jansky*

Koeeeit. The Story of the Aurora Borealis.

Levy, David H and Edberg, Stephen J, (1986). Observe - Meteors. Meteors Observers Guide. Astronomy League, Washington USA. *This guide is aimed at the amateur astronomer who is interested in making night observations of meteors.*

Levy, David. Clyde Tombaugh

Levy, David. The Sky

Levy, David. From the Black Hole to Infinity

Levy, David H, (1984). The Joy of Gazing - A Personal Guide for a New Observer; Second Edition. Royal Astronomical Society of Canada, Montreal, Canada. *An observing field guide designed for the newcomer to amateur astronomy.*

Levy, David H, (1989). Observing variable stars; a guide for the beginner. Cambridge University Press, Cambridge. *A thorough description of variable star observation aimed at the enthusiast. Included are description and classification of variable stars, active galaxies, asteroids and comets.*

Malin, Stuart, and Stott, Carole, (1984). The Greenwich Meridian, Ordnance Survey. Ordnance Survey, Southampton, England. *Following a historical account, the authors trace the path of the meridian through England and around the world and explain applications associated with it: navigation, mapmaking and the measurement of time.*

May. How Chronometers went to sea.

Monkhouse, Richard, and Cox, John, (1989). 3-D Star Maps. Harper & Row, New York. *Thirty-three maps of over 10,000 stars and galaxies can be viewed in 3-D through red-green glasses supplied with this book.*

Pasachoff, Jay M, (1977). Contemporary Astronomy. W. B. Saunders and Co., Philadelphia, USA. *This book is written for students with no background in mathematics and physics and attempts to give a contemporary view of the state of astronomy.*

Pasachoff, Jay M, (1977). Teacher's Guide to Accompany Contemporary Astronomy. W. B. Saunders Co., Philadelphia, USA. *Complete set of aids for use with "Contemporary Astronomy".*

Pasachoff, Jay M, (1978). Astronomy Now. W. B. Saunders Co., Philadelphia, USA. *Written for readers with no background in mathematics or physics, this textbook attempts a contemporary picture of the state of astronomy.*

Pasachoff, Jay M, and Kutner, Marc, (1978). University Astronomy. W B Saunders Co., Philadelphia, USA. *A textbook giving the contemporary state of astronomy and astrophysics and aiming for basic understanding of the topic.*

Pasachoff, Jay M, and Kutner, Mark L, and Pasachoff, Naomi, (1977). Student's Study Guide to Contemporary Astronomy. W. B. Saunders Co, Philadelphia, USA. *This guide provides chapter-by-chapter comments on the material covered by "Contemporary Astronomy", gives many extra example.*

Rosemergy, John C, (1977). Celestial Horizons - a Concise View of the Universe. Allyn and Baker, Inc, Boston, USA. *A textbook for beginning students of astronomy..*

Safko, John L, (1985). Instructor's Manual for Astronomy: the Cosmic Journey, Third Edition. Wadsworth Publishing Co., Belmont, USA. *For each chapter in the textbook, the teacher's guide*

provides (a) answers to the problems in the text; (b) sample test questions.

Seeds, Michael A, (1985). Instructor's Manual for Horizons: Exploring the Universe; A resource Guide. Wadsworth Publishing Co, Belmont, USA. *The teacher's guide, intended to aid in designing a course, contains suggestions for course outlines, planetarium programs, chapter-by-chapter notes, and a list of resources.*

Smith, Elske, and Jacobs, Kenneth, (1973). Introductory Astronomy and Astrophysics. W. B. Saunders Co., Philadelphia, USA. *Covers the solar system; basic stellar characteristics; the structure and content of our galaxy; the universe.*

Swihart, Thomas L, (1978). Journey Through the Universe. Houghton Mifflin Co., Boston, USA. *The purpose of this textbook is to present a fairly complete introduction to astronomy without burying the reader under an avalanche of detail, jargon, or erudition.*

RASC Observer's Guides
1978,1979, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996

Papers

A NEW SOLAR MODEL THAT EXPLAINS SUNSPOT ACTIVITY

February 25 1996 Steven D. Manders

The present solar model fails to explain the source of Sunspots, their magnetic activity, their migration, flares, the polar magnetic field and much more. The answers are in the convection layer which rotates about the equator faster than the radiation layer below it contrary to popular assumption.[1] The convection layer rotates at a constant speed throughout its depth, it has a newly found[2] sharp velocity gradient at the bottom but slows down as it approaches the polar areas. It could be described as an equatorial current 200,000 km. deep.

The Sun has huge rotating magnetic storms 100,000 km. in diameter and more than 50,000 km. below the solar surface (Fig 1).

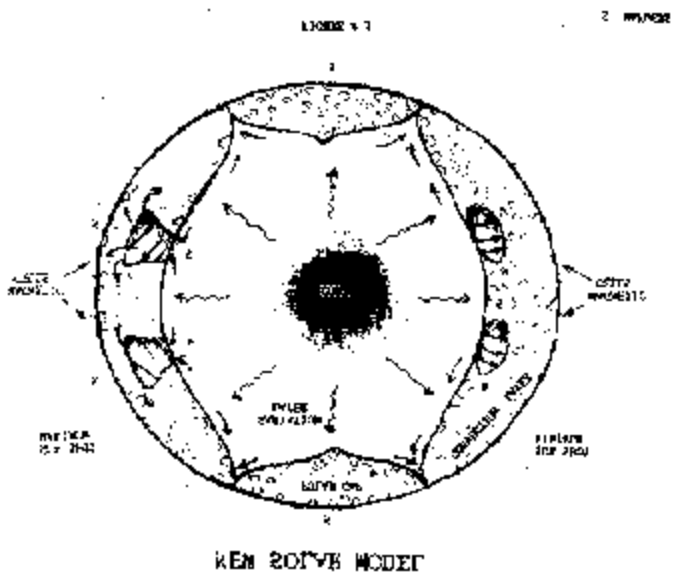


Fig #1. New Solar Model

These cells produce Sunspots and all their related activity. Sunspots appear every 11 years at about 35 ' north and south latitude, then slowly migrate to about 5' latitude. The next series of spots do the same except they have the reverse magnetic polarity. This is because these magnetic cells experience procession to the rotation of their axis caused by the rotation of the Sun. These cells rotate on their axis in a few Earth days and the axis itself rotates towards the equator making one complete rotation every 22 Earth years (Fig 2).

The cells are located at 20' north and south latitude but we only see the motion of the top. These cells are always

pulling towards each other because they have opposite magnetic polarity, but they do not migrate to each other because then they would be weakened by competing for the same heat source on top of the radiation layer allowing more heat to accumulate further from the equator strengthening cells there. The cells are strongest when vertical and transporting heat up nicely explains why Earth experiences slight warming during maximum Sunspot activity.[3]

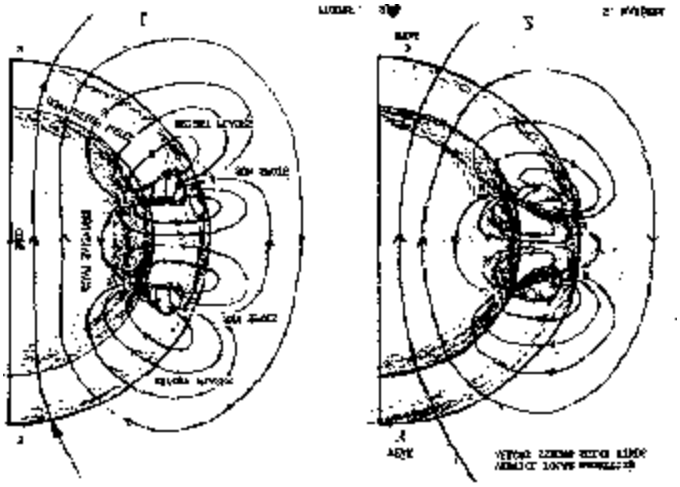
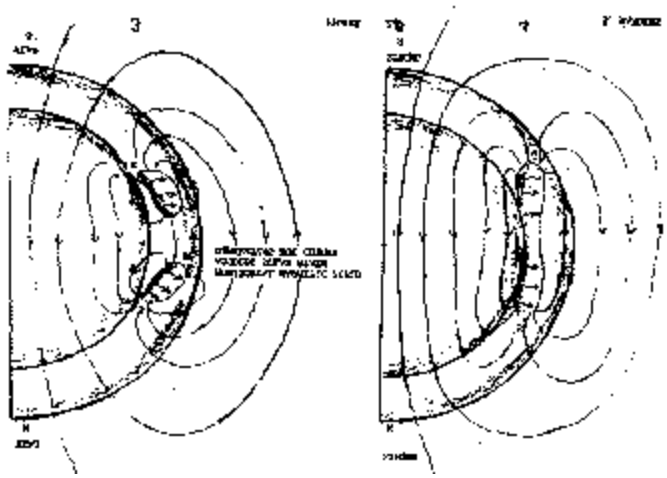
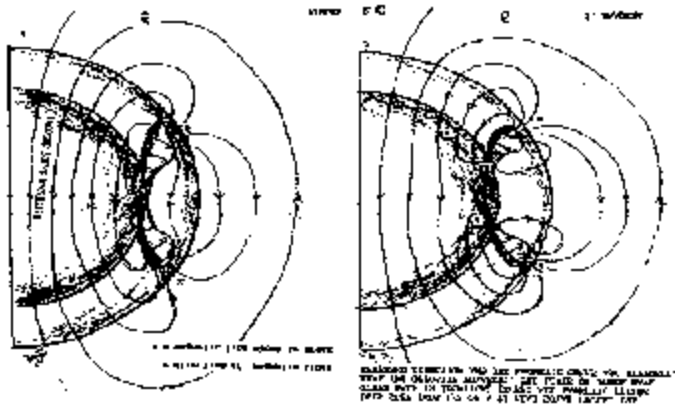


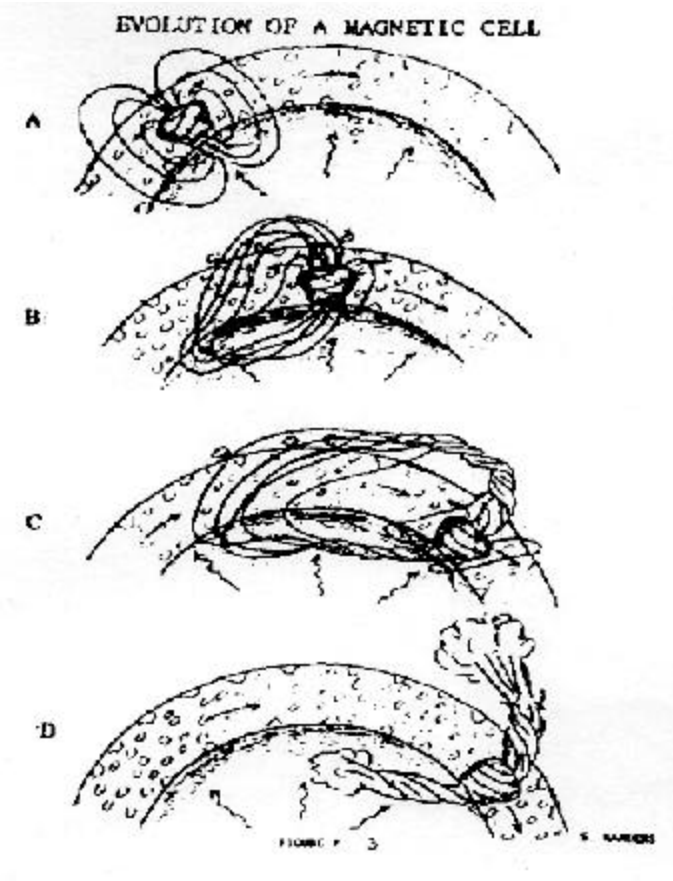
Fig #2a - Migration of Sunspots

These cells are made of rotating ionized gases that are electrically conducting and generate the magnetism. The magnetic field of these cells break through the solar surface and form Sunspots where the fields are so strongly concentrated that it blocks the flow of fresh hot material into that area. The hot gases flowing around the concentrated field create a great deal of heat from magnetic drag and that is the cause of the small flares associated with the edges of the spots. The magnetic field of these cells penetrates into the radiation layer but the equatorial current carries the cell away. The density of the radiation layer however presents considerable drag to the magnetic lines of force which remain put and are forced to stretch absorbing considerable energy. As the cells drift away, the field becomes oriented east-west (Fig 3b, 4c).



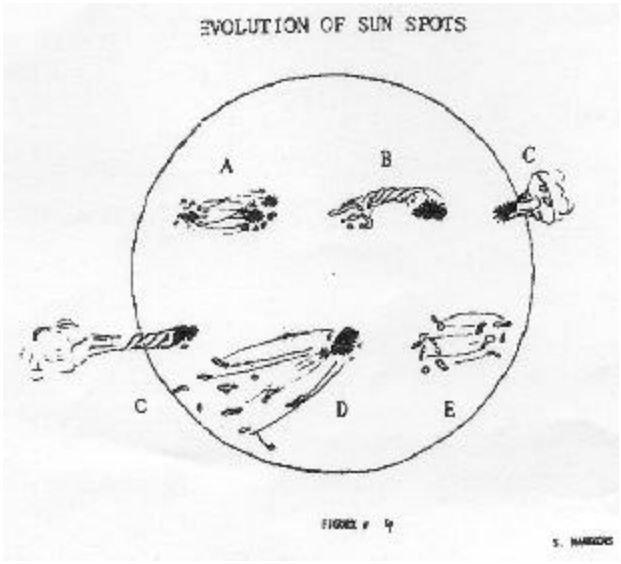
The cells rotation causes the field to become twisted as is shown in all giant flares (Figure #3C, 4B). This also causes many small spots that originally formed over a cell to converge. There is usually a preceding or P spot located over the cell and a following or F spot of opposite polarity. [4] The spots on the opposite side of the equator have the opposite magnetic orientation. The cell may drift away from the hot spot below that powered it leaving white hot plages from the magnetic drag and decay (Figure #4E) .





The lagging part of the field may be spread over a large area and create flares and plages where it break through the solar surface (Figure #4D). The most spectacular option occurs when the cell remains strong, the field becomes strong and twisted with a lot of stored energy then snaps creating a giant flare or prominence (Figure #3D, 4C). This propels the hot solar plasma eastward. The recoil from these giant flares drives the cells westward inside the equatorial current thus sustaining it. Earth receives strong solar winds from these events a few days later only when they are properly located on the western side of the Sun.[4]

Figure #2, demonstrates the source of the polar magnetic field and its activity. It is a broad extension of the many individual cells which all act in unison. The polar field reverses its polarity with the cells. The polar areas have a weak vertical field presenting little drag to high velocity plasma from the chromosphere or flares. Thus the solar winds are strongest there. This has been confirmed by the spacecraft Ulysses.[5] The horizontal magnetic field found closer to the equator present considerable drag to the high velocity particles, many at over two million km/hr. This generates the very hot corona. Oscillations in the magnetic field there would generate more heat. The low density there allows the magnetic field to dominate all material movement. Much was already known, what was missing was a model that explained it all.



All of this activity depends on the equatorial current, if it fails due to magnetic drag, the face of the sun will change forever.

BIBLIOGRAPHY

1 Jorgen Christensen-Dalsgaard. Nature 364, 407-411 (1995)
2 Jorgen Christensen-Dalsgaard. Nature 376, 641 (1995)
3 David F. Grey, Journal of the Royal Astronomical Society, 249-241 Oct, 1995
4 Harold Zirin, McGraw Hill Encyclopedia of Astronomy. 426-447 (1992)
5 Astronomy, 32. November 1995