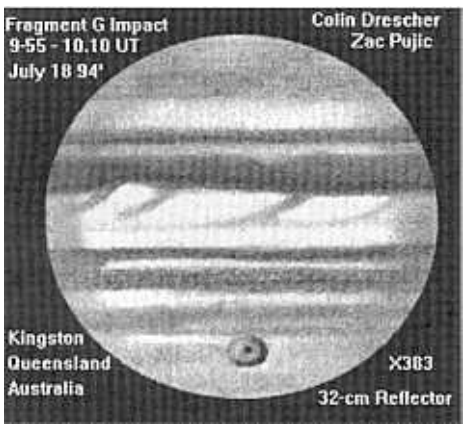
Amateurs observe comet impacts

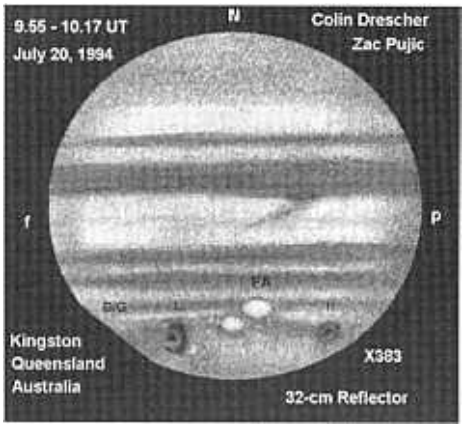
by Zac Pujic

After the initial sensation caused by the Hubble Space Telescope image of the impact site produced by Fragment A, most amateurs realised that some effects of the impacts would be visible in small telescopes. Amongst the first visual observations in Queensland made of the dark spots on the disk of Jupiter, were made by members of the Southern Astronomical Society (SAS) including Peter Marples and Greg Bock, observing from the Gold Coast. Greg and Peter observed the impact sites of Fragments A and E at around 5.50 pm Australian Eastern Standard Time and quickly contacted Jeff Ryder, Curator of the Sir Thomas Brisbane Planetarium who confirmed the observations. During Sunday night, the planetarium hosted a Jupiter Night during which members of the public could look through telescopes brought by amateurs to the grounds of the planetarium. Almost 2,500 people turned up to look at Jupiter, and the lines behind the 70 or so telescopes quickly reached double figures.

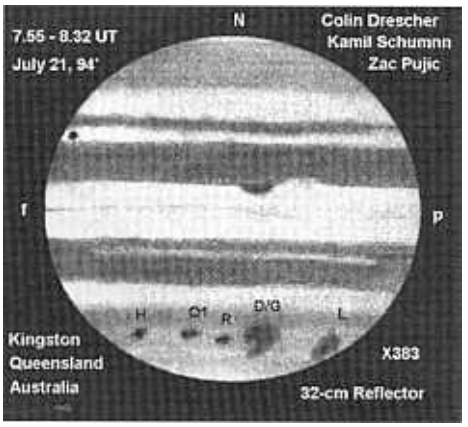
As if the initial observations weren't encouraging enough, the impact site produced by Fragment G on Monday afternoon created an exciting atmosphere in the astronomical community in Brisbane later in the night. Early in the evening, at 7.41 hrs UT, I observed a small plume produced by the impact. Just as I was running to the phone to call Greg Bock and Peter Marples, Greg called me to ask if I had seen it! Yes I had! By 7.53 UT, the plume had almost totally disappeared. Gregg D. Thompson, also

Drawing of impact site G by Zac Pujic and Colin Drescher. Monday, July 18 1994, around 10.00 hrs UT. 32-cm Newtonian, 4.8-mm Nagler eyepiece. X383 magnification.





Drawing by Drescher and Pujic. Showing the K impact site, the white oval FA, the large L site, and the D/G site coming into view on the southwestern limb. As these impact sites came into view, a large section of the limb appeared indented for about 10 minutes, a striking phenomenon considering the size of Jupiter.



Drawing of Jupiter around 8.00 hrs UT, July 21, 1994, by Drescher, Schumann and Pujic. Visible were the L, D/G, R, Q1 and H impact sites. Later in the evening, the E impact site rotated into view. The shadow of a Jovian moon is visible on the northwestern limb of Jupiter.

a member of the SAS, contacted radio stations and produced a commentary of the views, as did Greg Bock that same night.

Soon after the disappearance of the plume, a prominent indentation became visible on the southwest limb of Jupiter, as if it had been hit. We all wondered what was going to rotate into view and knew it would be something wonderful! Eventually, an enormous impact site became visible and excitement really mounted. Colin Drescher, another member of the SAS, and I made an accurate drawing of impact site G as well as transit timings which showed that the centre of the spot lay at longitude 311.9° system II and that the length of the spot was about 26°. I quickly sent an e-mail message to Brian Marsden of the International Astronomical Union (IAU) informing him of our observations, and for distribution via the IAU Circulars.

On Tuesday afternoon, we all waited for the K impact. During the impact, the Jovian moon Europa would be eclipsed by Jupiter, and due to its icy, reflective surface, may have allowed the flash from the impact of Fragment K to be visible by reflection. Unfortunately, even the most optimistic estimates were extremely pessimistic about the flash being visible, and this view was vindicated on Tuesday night. Despite intensive observing, no group, professional or amateur succeeded in observing a K flash reflection from Europa.

However soon after the impact had occurred, a plume was visible on the southwestern limb of Jupiter. The K plume was smaller than the G plume, but still managed to project several arcseconds beyond the limb of the planet. After about ten minutes, the plume disappeared. Another ten minutes later, a large indentation was visible on the southwestern limb of Jupiter. This eventually subsided and a large impact site rotated into view. It became difficult to make observations at this stage since Jupiter was dropping low towards the horizon. I sent another e-mail to Brian Marsden for distribution via the IAU Circulars and these observations were eventually released in Circular 6029. They constitute the first documented visual observations of these plumes by amateur astronomers in Australia (and as we learned later, in the World) and serve to demonstrate that observations made by amateurs, when made properly and confirmed, can prove extremely valuable.

The predicted N impact on Wednesday was not widely observed. The N fragment was small, and the impact site was visible only in high resolution photographs. We did manage to observe the K, L and G impact sites produced earlier and these all appeared as small black spots encircled by dark rings of various sizes and shapes. In fact, the impact sites produced by Fragments G and

L were massive and looked like eyes. Colin Drescher and I made transit timings of these sites and found the centre of the L site to lie at 273.2 ° system II longitude, while the centre of the G site still lay at 311.9 ° system II longitude. The impact sites were striking for their internal structure. The preceding sides of both the L and G rings were darker than the following sides. Furthermore, the northern side of both the L and G rings were attached to the L and G impact sites. A day later, I obtained an ultraviolet light image taken by the HST through the internet (see elsewhere in this edition of Southern Sky) which showed exactly what we had observed and sketched!

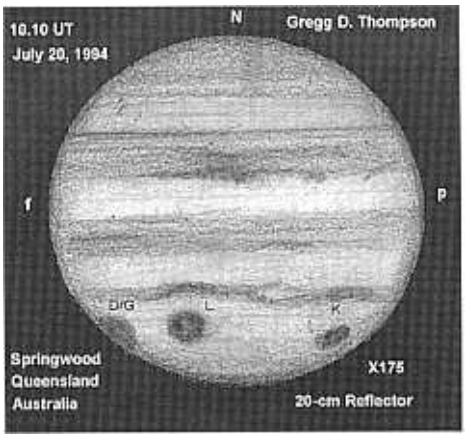
Although no fragments were predicted to hit Jupiter on Thursday (July 21st), we had plenty to observe. Observing at 7.55 hrs UT, we could see five impact sites on the disk of Jupiter, including those from Fragments L, the D/G complex, R, Q1, and H. Eventually, the E/F complex rotated into view providing a view of a planet with a pockmarked southern hemisphere.

By Friday, most astronomers were bleary-eyed from hours of observing, and although Australia was to see the last impact, the fragment was only a small one. Fragment W hit the impact site produced by Fragment K and the resulting K/W complex was large and showed a lot of internal detail. On Friday night, Colin Drescher, Kamil Schumann (yet another SAS member!) and I made a drawing of this curious feature about 2 hours after the impact of the last fragment. The southern hemisphere of Jupiter was particularly interesting due to the presence of the two white ovals BC and DE. Furthermore, a long dark streamer connected the K/W complex to the spot C, a feature which traversed over 50,000 km.

Some of the first observations of the effects of the Fragment A impact on Jupiter were noted by amateur astronomers.

Jeff D. Beish, Carlos E. Hernandez and Donald C. Parker, observing from Miami, Florida, USA, reported that observations under very good conditions (with a 0.40-m reflector, 381X) beginning on July 16 23.35 hrs UT showed a bluish cloud of an appearance unprecedented in their experience near Jupiter's south tropical belt, its core being of a similar size to the shadow of Ganymede (IAU Circular 6023). Jeff, Carlos and Donald are all long time members of the Association of Lunar and Planetary Observers (ALPO). Parker achieved fame in the amateur astronomy community as the first amateur to produce, some years ago, a tricolour CCD photograph of a planet. He also, co-authored the book "Observing and Photographing the Solar System".

Soon after the US reports, Dr John



Drawing of Jupiter by Gregg D. Thompson on July 20, 1994 at 10.10 hrs UT. The sketch shows the impact sites of Fragment K, L and the D/G complex. These major impact sites appeared to have dark cores surrounded by dark crescents. 20-cm f/8 Newtonian, 9-mm Nagler, 175X under good seeing conditions.

Rogers, an amateur astronomer and Jupiter Recorder of the British Astronomical Association was able to observe the dark impact sites with the 30-cm refractor of the University of Cambridge. These observations were reported in IAU Circular 6025.

Eventually of course, Greg Bock, Peter Marples and I (and other members of the SAS) were able to provide the first visual observations of plumes G and K to the IAU. The reason amateurs have played such a prominent part in the observations of the impacts is simple. Professional astronomers devote little time to the observation of the planets, and even less time to observations made in visible light, while amateurs devote much time to observing Jupiter in visible light. Consequently, while professionals observed the impacts in the infrared, amateurs observed in visible light and so were the first to make observations of impact sites and impact plumes. Furthermore, many amateurs used CCD imaging, a procedure which can obtain diffraction-limited information from small telescopes very quickly, to make photographs of Jupiter. Due to atmospheric turbulence, the resolution of even very large telescopes is rarely better than that of a good 20-cm telescope, and so amateurs have been able to use their small telescopes very efficiently.

Amateurs were amongst the first to provide visible light photographs of the impact sites. Steven Williams, of Grove Creek Observatory in New South Wales, was able to photograph Jupiter with a Celestron-14 and an SBIG ST-4 CCD camera. His photographs show the impact sites produced by Fragments C, G, H, K and N. In Barcelona, Spain, J. M. Gomez of the Grup d'Estudis Astronomics used a Lynxx CCD camera and a 40-cm telescope to obtain images which show detail visible only during periods of good seeing with a high resolution telescope.

The coming weeks, and hopefully, months will allow amateurs a chance to observe the impact sites with ease. Rarely, have amateurs had the chance to observe a phenomenon such as a comet impact on a planet, and Australia has a ringside seat. Jupiter is poorly visible from the northern hemisphere, so this is our chance to make meaningful observations. Everyone should take this opportunity to make accurate drawings, transit timings and photographs so that Jupiter's appearance can be thoroughly documented for posterity. The table has System II longitudes for some of the impact sites, so observers should be able to calculate their times of central meridian transit. If not, send a stamped, self-addressed envelope to the address below and I will supply interested observers with CM transit times and Jupiter observing forms for the upcoming weeks.

Southern Sky will be including more amateur observations of Jupiter in the next issue, so send in your observations to Zac Pujic, c/o **Southern Sky**, 6/64 Warren Street, St Lucia, 4067. Queensland.

Table of impact sites

Impact Site	Jovian Lat	Long*	Relative Size	Description
A	-43	104	small	diffuse spot
C	-43	145	small	diffuse, bar shaped
D	-43	319	small	near G site
E	-43	83	medium	dark spot
G	-44	312	large	dark with structure
H	-44	23	large	dark with structure
K	-44	203	large	dark spot, near W
L	-44	270	large	dark with structure
Q1	-44	349	medium	dark, bar shaped
R	-44	328	medium	dark spot, near G site
S	-44	324	large	dark spot, near G site
W	-44	209	large	dark spot, near K

* System II longitude

This table should help observers find and identify the impact sites on Jupiter. Reasons why other fragments were not included:
I and O are omitted in naming fragments.
J and M disappeared before impact.
Fragments B, P1, P2, and N did not create large impact sites.
F, T and V did not create large impact sites and/or are near impact site E.
U did not create a large impact site and/or hit near the K/W complex.
Q2 did not create a large impact site and/or hit near the G/D/R/S complex.