

Astronomy at Puimichel Observatory

by Zac Pujic

Puimichel is a small hilltop village in the Haute Provence area of southeastern France. It is also home to the largest amateur-constructed and operated observatory in Europe, possibly the world. A 42 inch (106 cm), horseshoe-mounted reflector is the culmination of hard work by two amateurs; Arlette Steenmans and Dany Cardoen. Although it is known throughout Europe as a focal point of amateur astronomy, few Australians have heard of Puimichel Observatory.

Around the early 1970s, Dany Cardoen, a Belgian amateur, decided to build his first telescope. The result was a 41 cm f/5 reflector on a rock steady German equatorial mount, an "impossible" telescope at the time. He also decided to find better skies - Belgium has the worst level of light pollution in Europe. Heading towards southern France in the region of Provence, he and Arlette Steenmans tested the skies near the Observatoire de Haute Provence in the early 1980s and realised that the village of Puimichel would be a good place to set up an amateur observatory.

Puimichel is a small French village with origins going back about 3000 years. Dany decided to build a large reflector of around 1 metre aperture but he first, prudently, built a smaller telescope of 52 cm aperture to see if it was feasible to build the 1 m telescope. Dany constructed the 52 cm with ease. Encouraged by the experience he went ahead with the 1 metre. With the help of the famous astrophotographer, Hans Vehrenberg and Gerhardt Klaus, Dany and Arlette obtained a mirror blank from Mike Simmons. The blank was originally used by Warner and Swasey as a flat for testing their optics. It was Warner and Swasey who built the German equatorial mounts of the two largest refractors in the world, the Yerkes 40 inch and the Lick 36 inch.

In a very discouraging turn of events, the mirror cracked one night during the grinding stage. Undaunted, Dany managed to secure another blank from Schott. This now forms the 1m mirror, the original cracked 1m blank is used as a coffee table. This table is located outside the astronomers' sleeping quarters and is, considering its origins, quite an historic relic.

After attending the 1993 Queensland Astrofest, I flew out to France for a whirlwind, two day tour of Paris. With grim determination I saw the Eiffel Tower, Champs Elysées, Arc de Triomphe, the Mona Lisa,



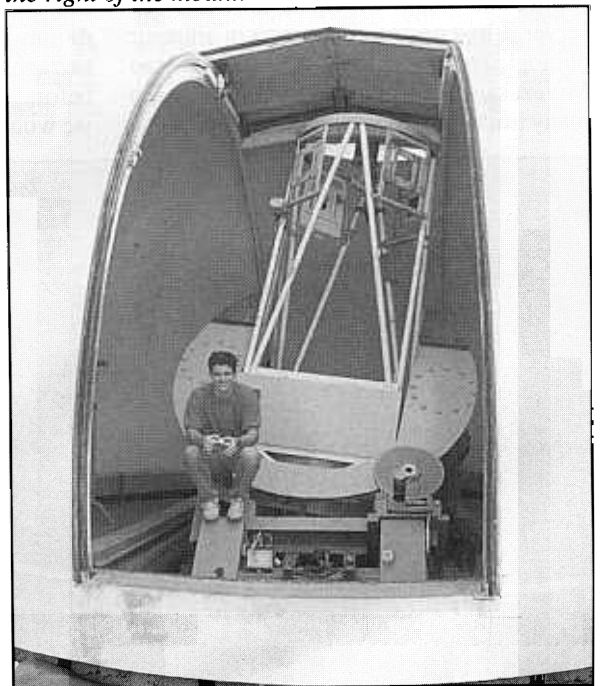
The village of Puimichel from near the 1m dome.

Venus de Milo and the Notre Dame de Paris! Finished with Paris, I spent several days at Montpellier on the southern coast to attend a neuroscience conference, then travelled through Avignon, Nîmes, and Marseilles by train, arriving at La Brillane train station on August 28th, 1993. There was only one taxi at the station, so I approached the driver (who spoke no English) and said my one magic word: "Puimichel". It didn't work, he looked hesitantly at me, so I pulled out a map of the area. He waved it away and motioned me to get in. It was getting pretty dark as we drove at an alarming speed through the town of Oraison and into the French countryside. The terrain was quite hilly, though not mountainous and as the taxi sped along the narrow country lanes the reason for the driver's initial hesitation at taking me to Puimichel, became evident - the driver reeked of alcohol. Obviously, he did not like the chances of surviving a trip, in failing light, to Puimichel, surrounded as it is by hills and intoxicated as he was.

Eventually we arrived at Puimichel and despite the poor evening light and my shaken condition, I could make out a gorgeous little village perched on the tip of a hill. The driver realised I was an astronomer - English speaking visitors rarely visit Puimichel for reasons other than astronomy - for I was led to La Remise, the guesthouse of

the association and home to Dany and Arlette. After being introduced to some visiting English amateurs, we had dinner at 9 pm and walked to the dome of the 1m. The night was magical since the sky was cloudless, largely due to the presence of the Mistral - the prevailing wind which blows from the north throughout the European summer. On such a night, both the turbulence and clarity of the atmosphere are high. The 400 metre walk to the dome looks out over rolling fields of lavender, wild blackberry and low oak forests while the mountains of

Hugues Orhand, a visiting French amateur and the 1m telescope. The RA drive assembly is visible near the right of the mount.



Gorge du Verdun rise along the horizon.

The 42 inch telescope is massive. We walked into the dome through the northern pier of the horseshoe mount and ended up directly underneath the mirror. The dome is about 8 metres in diameter and the telescope weighs about 3 tons (the old, heavy-type tons!). On the ground floor is a small control room which houses two computers used for image analysis and for CCD guiding using an SBIG- 4 ST- 4 autoguider. On this first night at Puimichel, Dany showed me CCD images taken weeks earlier. It had been a long time since I felt so spellbound about amateur astrophotographs as I did on that evening. I was shown tricolour CCD images of the Crab Nebula that rivalled *everything* professional photographs had ever shown. The Crab Nebula seemed to have never-ending filaments of nebulosity in greens, reds and yellows. The Orion Nebula showed unreal three-dimensionality and such fine, intricate detail in the nebulosity that it was hard to believe the CCD camera was also an amateur effort.

I was shown image after image of galaxies which showed fine structure in their spiral arms and unimaginable detail in their form and of galaxy-lensed (double) quasars! But this was only to be the beginning. I was later shown Technical Pan 2415 (black and white) photographs of objects photographed through the 52 cm and 106 cm telescopes. These astrophotographs defied description in their beauty and technical perfection. In particular, I saw a photograph of M64 which showed fine, intricate detail within the dust cloud near the nucleus. I saw globular clusters clearly defined around the Sombrero Galaxy (M104) and detail in Jupiter and Saturn which, as an ALPO observer, I had never before seen in amateur photographs except from the work of Isao Miyazaki and Donald Parker. I have seen many impressive photographs in *Sky & Tel-*

lescope, Astronomy, Sky & Space and *Southern Sky* magazines, but what I saw at Puimichel made me drool.

On a few occasions, Dany showed me the facilities he has for grinding mirrors and building telescopes. His house is full of optics in various stages of work. Numerous shelves full of glass, photographic film and astronomy books covered the walls. Dany also showed me a 30 cm objective lens given to him by the European Southern Observatory which he says, after some corrective work, will find a place on the 1m telescope. This seemed like a lot of work considering he can routinely grind mirrors up to 50 cm to a high state of finesse, but he explained it was the challenge of refiguring the lens which interested him.

Association Newton 406, as the organisation which manages Puimichel Observatory is called, can accommodate up to 60 amateurs at a time. A few days after I left, the International Meteor Organisation was to hold its annual meeting at Puimichel with around 60 amateurs attending from all over Europe. There are facilities for living very comfortably for as long as one wants. Guests can either stay in single or share rooms. A large dining hall is usually the centre of activity, especially at breakfast, lunch and dinner times. Arlette's cooking is superb and there was always so much to eat. Dinner was especially enjoyable as everyone would talk about observing conditions in their country or show their photographs from months ago or from the night before! After dinner, usually by 9.30 pm we would see if the night looked clear. If it



The 52 cm telescope.

was we would all rush to the observing fields where the 18 inch, 20 inch and 42 inch telescopes are located. The 18 and 20 inch telescopes are freely accessible to the registered astronomers, but in using the 42 inch I required help from Dany.

The 18 inch telescope is a fork mounted Newtonian. I rarely used it because, if the sky was clear enough to observe then it was clear enough to do astrophotography - the 18 inch reflector was designed for visual use only. The 20 inch telescope was of similar design, however, it has been optimised for photography. Usually, the hardest thing about using it was opening the octagonal shed that houses it. Once the shed was opened, it was possible to have an exposure started within about 4 minutes. The drive motor is extremely accurate and the fast $f/3.8$ focal ratio means that exposures can be short and still show immense detail.

The seeing was usually average, rather than good. When the Mistral blew the sky would clear very quickly but the atmosphere rapidly became turbulent. I have two photographs of M15 made with the 1m telescope. One made during really turbulent conditions doesn't show the secondary mirror vanes, while the second photo, taken during calmer weather, shows sharper star images with secondary mirror vanes. The 1m is also set up for eyepiece projection photography. I used my own equipment which, unfortunately, only gave a focal ratio of $f/19$. The images of Saturn I made



The dome of the 1m telescope. The slit of the dome is motor operated, though turning the dome is still done manually.



Dany Cardoen and the 1m telescope. The ST-4 autoguider is visible on the Serrurier truss mount. The Newtonian focus was available at any of four positions.

off-axis guider was sometimes time consuming. Using the 52 cm reflector was easier. In any position the camera and off axis guider were always in an easy-to-reach position. The drive was accurate, though fine controls in declination were done with a manual tangent-arm assembly.

Puimichel Observatory is continually being expanded. A large Schmidt telescope of around 66 cm aperture will soon be installed, while complete computer control of the 1m will facilitate its use by amateurs. During the day, other French amateurs and I visited the Observatoire de Haute Provence, the domes of which are visible only about 20 km away to the west of Puimichel. Dany refigured a 60 cm mirror for the observatory. Nearby, the winding mountains and canyons of the Gorge du Verdun were absolutely spectacular but took the better part of an hour to reach. The whole countryside is dotted with lovely villages like Moutiers. Above this particular village was a small chapel, perched on an imposing cliff-face overlooking the valley below.

While I am not sure if anyone else from Australia will visit Puimichel (I have the distinction of being the first Australian, and I suspect, the first person from the southern hemisphere to do so) I can say that few times in my life have I enjoyed myself as thoroughly as I did during my stay there. It was so easy to totally immerse myself in astronomy and to forget the outside world.

In the outside world, accommodation at Puimichel costs around \$A50. This includes all three meals and the use of the 20 inch telescope. Use of the 42 inch costs roughly \$17 per hour. Dany can hypersensitise film for about \$3 a roll and a small fee covers use of the darkroom. Anyone interested in staying at Puimichel should write to Dany Cardoen, Association Newton 406, La Remise, 04700 Puimichel France. ■

onto Ektachrome 100 film are sharp but small. However, Dany showed me photos made at around $f/150$ of Saturn and Jupiter where the planetary disks are about 4mm across on the negatives! Achieving this using ordinary amateur telescopes is extremely difficult.

I looked through the 42 inch telescope on a few occasions. At magnification 397 using my 9 mm Nagler the central star in the Ring Nebula was clearly visible without averted vision during full Moon. The Dumbbell Nebula displayed numerous clumps and fine detail while the north equatorial belt of Saturn was clearly split into two components. Even the small planetary nebula NGC 6765 in Lyra showed detail in its structure which is very difficult to observe in a telescope of less than 25 inches aperture.

Taking astrophotographs using the 1m was easy. Setting up was the harder part. At least one problem became apparent: when pointed in many directions in the sky, the camera of in the prime focus position was invariably in an uncomfortable position for photography. For example, photographing an object like the Andromeda Galaxy at the zenith would have been dangerous. I would have had to have stood on ladders and supports suspended directly over the main mirror, and my head would have been at a height of at least 5 - 6 metres above the observatory floor. In other positions, the camera would have ended up on the 'top' of the tube. Only when photographing objects in the northwest and about 50° above the horizon was the camera in a good position to allow guiding with the off-axis guider. Guiding was easy. The drive was accurate enough to require minor corrections only every 4 or 5 minutes in RA or DEC using the electronic controls. Although a fully functional SBIG ST-4 autoguider was available, it required Dany's

assistance. If he was occupied, amateurs simply guided with the off-axis guider.

Perhaps the hardest part about photographing with the 1m was finding objects to photograph. A great fallacy amongst astronomers is that a perfectly balanced telescope can be moved with the push of a child's finger. This is patently untrue. A perfectly balanced telescope is one that requires an equal amount of force to be moved in any direction and will not budge once it is pointed at a particular object, with the axes locks unlocked. To use an analogy, a car with its brakes off on a flat driveway will not move because it is horizontally and vertically balanced. But it certainly takes more than a child's push to move a car! The large mass provides sufficient inertia to prevent easy movement. So it was with the 1m telescope. It required quite a lot of force to move it smoothly - computer controlled slewing motors are presently being installed. Consequently, finding an object and ensuring that the camera was in an available position for guiding with the

The mount of the 1m telescope. The red declination tangent arm can be seen next to the yellow mirror box. The declination axis is hollow to allow installation of a Nasmyth focus.

