Mem. S.A.It. Vol. 92, 76

Memorie della

Pulsars, SRT, and INAF: three focuses, one vision

A. Possenti[1]

Istituto Nazionale di Astrofisica – Osservatorio Astronomico di Cagliari, Via della Scienza 5, I-09047 Selargius (CA), Italy e-mail: andrea.possenti@inaf.it

Abstract. There have been three major passions in the scientific life of Nichi D'Amico: the investigation of the pulsars, the construction and development of the Sardinia Radio Telescope, and the growth of INAF and of the people working in that. In this contribution, I'll report my personal view about some aspects of these three phases of Nichi's career. Particular emphasis is devoted to the first phase, which is paradigmatic of the traits of the Nichi's character which signed all his working trajectory and allowed him to transform in reality the vast majority of his visions.

Key words. Pulsars. Pulsar survey. Pulsar: PSR J0737−3039A/B. Radio telescopes: Parkes, SRT

In his career, Nichi D'Amico had three great passions: first the pulsars, in a second phase the Sardinia Radio Telescope (SRT) and the associated Cagliari Astronomical Observatory, and finally the national institute INAF. All three linked by the fundamental common *red thread* who joined (i) the *love for science and knowledge*, with (ii) a *primary attention to the Institutional role of the research and of its bodies* in the local, national, and international landscape, and with (iii) a clear vision of the *utmost importance of the growth of the human capital*. Nichi left his marks on all of the key main streams reported above, as only special people can and know how to do.

1. The love for the pulsars

Nichi plunged into his first passion long before I had the lucky opportunity to meet him. A passion that translated into a twenty-year long journey, between Australia, Bologna and Cagliari, which Nichi undertook during the '80 of past century and which had a striking scientific seal with the discovery of the still unique Double Pulsar on 2003-2004. An outcome not at all generated by chance. On the contrary, that resulted from the perfect combination of the three lines of actions that Nichi - with total dedication and tireless constancy - had planned and then followed during the preceding decades.

1.1. Nichi's sense for the key experiments

The first pillar was the acquisition of a deep knowledge of the field generically indicated as pulsar science. A knowledge that Nichi started accumulating since the early years in Sicily working about the themes of the pulsar detection in the gamma-ray, as witnessed by the con-

tribution of E. Massaro in this Volume. That knowledge was later highly perfected over the long years spent traveling between Europe and Australia, and working alongside the world leaders (e.g. Figure 1) in the sector of the radio pulsars [e.g. see the contributions by Dick Manchester and Michael Kramer in this Volume]. In those years, Nichi deeply put his hands in the observations and the software for data collection and analysis, leading to significant improvements of the pulsar detection capability of the large surveys (e.g.(Manchester et al. 2001; D'Amico et al. 2001)).

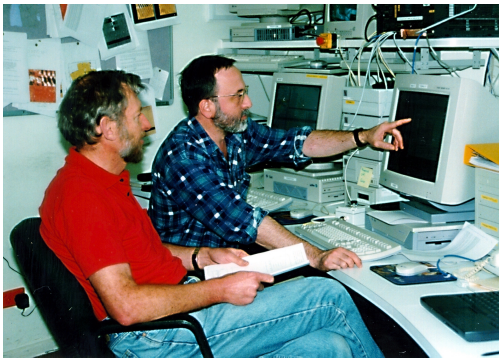

Fig. 1. Nichi D'Amico and Dick Manchester working together in the control room of the Parkes radio telescope, sometimes in the Nineties (credits John Sarkissian-ATNF).

While doing that, he never missed the reasons and the final aim of all of this, namely the investigation of the fundamental laws of the Nature(Burderi & D'Amico 1997) [see the contributions by Luciano Burderi and Aldo Treves in this Volume]. Moreover, he grew that rare capacity to smell the experimental directions where, with the unavoidable help of a bit of luckiness, the Nature could allow us to unveil part of its secrets. On one hand, this sense for the important science ensured him being at the frontline of the worldwide publication record in pulsar astronomy (71 refereed papers, with typically 5 to 10 collaborators at most, during the golden era among 1998 and 2004, before Nichi's interests re-directed toward managerial activities) and, on another hand, resulted decisive for what followed, as described below.

1.2. Nichi's sense for the technology

The second pillar in the lines of action of Nichi during those years was the technological experiences he gained working with the people and in the context of the Medicina radio astronomical Station. As nicely remembered in the contribution by Stelio Montebugnoli in this Volume, Nichi was really able to understand all the details of the electronics of the apparatuses and gave key indications to his skillful collaborators for making the systems better and better.

My first direct experience with Nichi was exactly in this context, when I met him for the first time in my life, in the dark back-end room of the Medicina Station. It was fall 1996, and his eyes brightened the room while showing to me the working and the features of boards, multiplexers and filter-banks, all man-made there. For sure the passion for those things stemmed since Nichi's youth, when he invested a lot of his spare time in drawing and building electronic machineries, following suggestions derived from magazines alike *Sistema Pratico* or *Nuova Elettronica*.

But it was not simply a falling in love with the setup of instrumentation... He fully realized that making available new state-of-art equipment was the key to enter the button room in the big collaborations of modern astrophysics. Today this is a common notion, but not at that time. In fact, I remember that not everyone in the Italian community were convinced of Nichi's decision, when, after winning a large national grant, he used most of the money to build instrumentation in Italy, but then, during 1997, he virtually donated all of that to Australia, to improve the back-end room and the capacity of the Parkes radio telescope. That instrumentation (see Figure 2) was one of the seeds for the exceptional harvest of pulsar discoveries produced by the Parkes telescope in the subsequent dozen years, and allowed Nichi to join his masters Dick Manchester and Andrew Lyne in the steering room of those as yet unsurpassed (in term of pulsar discoveries) series of experiments.

Fig. 2. *Right panel*: The back-end room of the Parkes radio telescope during November 2011. Of the many pictured racks, some were still hosting the equipment sent there by Nichi D'Amico in 1997. Those apparatuses contributed significantly to the unprecedented success of the various Pulsar Surveys performed at Parkes during the years 1998-2004, which led to discover hundreds of pulsars, among which the still unique Double Pulsar PSR J0737−3039A/B. *Left panel*: Detail of an analogue filter-bank, built in Italy and labelled with the stamp of the Observatory of Bologna (bottom left of the front panel). This filter-bank was a key ingredient for the discovery of 12 millisecond pulsars in 6 globular clusters, during a survey led by Nichi in the years 1999-2001 (credits Marta Burgay).

Fig. 3. The PhD students attending a National School organized during 2003 by the Astronomical Observatory of Cagliari were taken by Nichi to the SRT site, where they stretched out their arms and joined their hands eventually creating a circle around the just dug 40m wide hole which would have later hosted the foundations of the Sardinia Radio Telescope (courtesy of INAF-OAC: photo by Gianni Alvito).

1.3. Nichi's sense for the human factor

The third pillar was the capability of Nichi to grow around him an Italian pulsar group, created from scratch, first at the Astronomical Observatory of Bologna and then at the Observatory of Cagliari. Behind the very few words that he was used to say to all his students (always calling them with the third person, until they explicitly asked him to give up to that), there was a person of exquisite sensitivity, who really knew how to sow the seeds to make people grow, and then followed them and cared about them, always. This - with no need for bombastic proclamations - was his secret to creating a group.

Many years later, when he reached a much higher level position, Nichi finally expressed in a sentence what was his attitude since the beginning: *One of my primary tasks, as a University Lecturer, as Director of the Astronomical Observatory of Cagliari and, now, as President of INAF, is to create the best conditions for researchers, and especially the younger ones, to first imagine and then pursue their scientific dreams* (from the original Italian version: *Uno dei miei compiti primari, come Docente Universitario, come Direttore dell'Osservatorio Astronomico di Cagliari e, adesso, come Presidente dell'INAF, è quello di creare le condizioni migliori perché i ricercatori, e specialmente quelli più giovani, possano prima immaginare e poi perseguire i loro sogni scientifici*). I think the photo in Figure 3 nicely translates his words above in a picture that I had the pleasure to organize with him in October 2003 [see also the contribution of Giuliana Fiorentino in this Volume].

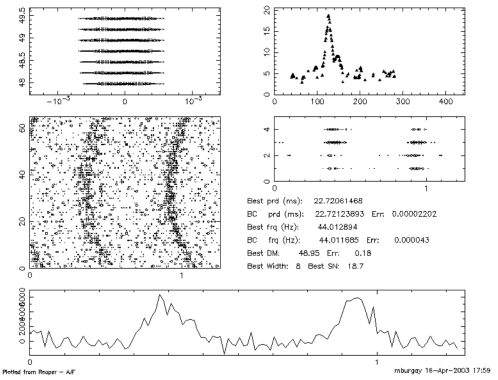

Fig. 4. The original discovery plot of the pulsar PSR J0737−3039A, which is still nowadays the most important known testbed for constraining the predictions of the General Relativity in the context of the orbital decay due to gravitational wave damping, besides manifesting the largest number of detected additional relativistic effects. Shortly later, also the pulsar PSR J0737−3039B was discovered and the binary became the first and as yet unique Double Pulsar system (credits Marta Burgay).

1.4. Premises and context for an unique discovery

Although the end of the story is well known and also repeatedly mentioned in this Volume [see for instance the contribution by Marta Burgay], it is time now to see how the three pillars described above eventually combined as the pieces of a puzzle, to create the premises for the discovery of the Double Pulsar.

After the completion at Parkes of the very fruitful pulsar search in the Galactic plane (many hundreds of discoveries) there was a range of different opinions in the leading team of the project about what was worth to do afterwards. One option was to try to look also outside the Galatic plane and at lower Galactic longitudes than those investigated during the previous survey. While others were still hesitating in allocating students to that (and there was someone even against this extension of the survey), Nichi seized the moment and communicated that that was a very good idea for him and that the Italian group would have committed people and resources of calculus to lead that. Nichi had crafted the context for everyone to approve his proposal and in the next couple of years Marta Burgay was the PhD student in charge of the so-called PH Survey, an experiment the large majority of which, as Nichi had announced, was indeed carried on by her and the Nichi's Italian team (Burgay et al. 2006). As Marta Burgay remembers well, it was not *all roses and flowers*, with the rate of discoveries which was (as expected) much lower than that of the previous surveys along the Galactic plane. Marta, with the perspective of writing a PhD thesis with no much material on her hands, at a certain point in her third year of PhD also started being worried, but Nichi always promptly reassured her, calling for a bit of patience, since some interesting millisecond pulsar *had* to emerge from the inspection of all that portion of the sky. Of course, he could not imagine how much extraordinarily would have been *The* discovery, but his words, certainly much more than mine, kept Marta confident and focused until the day in which the first and still unique Double Pulsar (Burgay et al. 2003; Lyne et al. 2004) emerged from the tons of postscript files associated to her putative pulsar candidates: see the original postscript plot in Figure 4.

2. SRT and the Observatory of Cagliari

The talent of Nichi in growing groups and motivating people became even more relevant when he concentrated on giving the second life to the Astronomical Observatory of Cagliari and to allow the SRT project to really see the light [as nicely described also by the contribution of Ignazio Porceddu in this Volume]. The Sardinia Radio Telescope project has become not only the second (sorted in time) scientific center of Nichi's life, but, thanks to his visionary attitude, turned out to be the aggregating magnet around which an entire generation of researchers, technologists, technicians and administrative staff matured. Obviously, all of them had a differentiated working path, as well as a human project; from the beginning, Nichi had perfectly in mind all of those aspired trajectories, and never stopped thinking about how to fit them in the big SRT project. As a matter of fact, his indomitable stubbornness allowed him to lead to completion the largest part of those aspirations, during times in which acquiring one unit of personnel every 5 years seemed the maximum achievable for an Observatory of the size of that of Cagliari [see the related contribution by Salvatore Sciortino in this Volume].

The most thrilling moment, in the $\sim$ 12 years of the construction of the telescope (since when the first pole was stuck in the ground until the opening ceremony), was the day in which the two main parts of the telescope were joined together, thanks the lift of the rib structure (due to host the primary mirror) on top of the alidade. A unprecedented operation, which Nichi strongly wanted and accurately planned, despite it could have carried some risk for the entire project (see Figure 5 and also the contribution of Ignazio Porceddu for an additional photo, shot about 1 hour before the one displayed here). All the pressure was on Nichi... but we was right: the lift was a great success and the community had the telescope available one year earlier than originally scheduled.

I really envied him the extraordinary ability, refined over the years (and which I appreciated even more when I faced my personal management experience) to separate the working worries - inevitably related to his role - from the rest of his life. A mental cleansing that allowed him to develop new ideas for old problems the next day. It was obviously not infallible, but his vision, this is my direct experience of years spent close to him, ended up being confirmed by the facts, except for very rare cases.

3. INAF: Nichi's sense for the Institution

If they appoint me, I'm putting a quiet retirement at risk... (the original in Italian sounded as: *Se mi nominano, mi sto giocando una pensione tranquilla...*). With these words, expressed with the usual irony, Nichi announced to me, well before making it public, his intention to try to run for the role of President of INAF.

When I heard that, my heart lightened at the thought of what he could have done in such position. In fact, I had seen in several occasions, during the difficult years of the construction of SRT, his ability to work with patience, but also with a very strong determination and a very clear vision, for the pursuit of a precise goal. His attention always focused to the benefit of what he was aiming to achieve, but also always subjected to a complete intellectual honesty.

As with all the activities he had undertaken previously, he threw himself headlong into the Presidency of INAF, with the wonderful ability to be President only when needed, but the usual Nichi at any other time. And the effects of his attitudes, skills, visions of science, and sense of the Institutional role of INAF are there for everyone to see and are well described in several contributions in this Volume, alike the ones written by Gaetano Telesio, by Filippo Zerbi, by Stefano Giovannini, by Grazia Umana, and by Corrado Perna.

INAF today is a finally cohesive Institute, with its own research line, its soul, its very respected institutional position, and a park of human capacities grown both numerically and qualitatively as no one could have even imagined a few years ago. What Nichi leaves to

Fig. 5. The picture was taken during a crucial day for the SRT project (22 May 2010) when the structure hosting the primary mirror of the telescope was lifted on top of the alidade. That required to enroll the tallest crane available in Europe (above 100 meter in height), here depicted in red. A similar operation had never been attempted before at any other 64m (or larger) radio telescope, but Nichi D'Amico, although conscious of the putative risks, explicitly pushed for that. Everything went fine and this operation saved at least 1 year to the total construction time of the telescope (credits: INAF-OAC).

INAF is a great task: a legacy made of inexhaustible enthusiasm, infinite ability to listen, the lucid ability to go to the root of the problems, and to consider the primary importance of the people with whom one works. An exceptional basis from which to restart, as highlighted in the contribution prepared by Marco Tavani for this Volume.

A legacy also made up of very few adjectives and simple and never forced words, with which he made himself clearly and unambiguously understood by everyone: by his students, by his colleagues [as nicely remembered in the contribution of Flavio Fusi Pecci in this Volume], by his superiors (when he had any), and finally by his institutional interlocutors and by the politicians, when he had the role of speaking to them in order to represent, very often with success, the needs of science and of INAF.

4. A lot beyond work and science

I want to finish my contribution with remembering you like this, Nichi: as a man of science and humanity that the more you hang out, the more you learn to appreciate. A man with the willing spirit and acute intelligence of a person who always knew how to be the right one at the right time, for institutions, for collaborators and for friends. That rare kind of person that everyone of us would always like to have in the circle of our relationships, one of those who make life and work a full and fascinating experience.

References

Manchester, R. N., Lyne, A. G., Camilo, F., et al. 2001, MNRAS, 328, 17. doi:10.1046/j.1365-8711.2001.04751.x

D'Amico, N., Lyne, A. G., Manchester, R. N., et al. 2001, X-ray Astronomy: Stellar Endpoints, AGN, and the Diffuse X-ray Background, 599, 598. doi:10.1063/1.1434695

Burderi, L. and D'Amico, N., 1997, ApJ, 490, 343-352, doi: 10.1086/304846

Burgay, M., Joshi, B. C., D'Amico, N., et al. 2006, MNRAS, 368, 283. doi:10.1111/j.1365-2966.2006.10100.x

Burgay, M., D'Amico, N., Possenti, A., et al. 2003, Nature, 426, 531. doi:10.1038/nature02124

Lyne, A. G., Burgay, M., Kramer, M., et al. 2004, Science, 303, 1153. doi:10.1126/science.1094645