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R. E. NATHER – THE FOUNDER OF THE WET

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Abstract. A tribute to Ed Nather includes some bibliographical data and three speeches presented at the 1st Whole Earth Telescope Workshop in Austin, Texas, November 1991.

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1. Introduction

In the history of astronomy, introduction of new techniques gives from time to time unexpected results. When a new frequency or time domain is explored, we have to expect something unexpected. We have to keep our eyes and mind open and look for something we didn't know before. Some people make exploring and opening new fields their lifestyle. R. E. Nather, or Ed, as we call him, is such a person. During this workshop he has proposed a name for a new field of astronomy: "temporal spectroscopy" – a field where Ed predicts results to come "thick and fast".

What he means with the term "temporal spectroscopy" will become clear from the next talk. The unusual with Ed was that he came to astronomy as a self-taught man. Eventually he got certified by taking a Ph.D. degree in astronomy in Cape Town in 1972, and became an associate and later a full professor in astronomy at the University of Texas (UT) at Austin, Texas. Today he is the Rex G. Baker, Jr and McDonald Observatory Centennial Research Professor in Astronomy.

The prelude to his career in astronomy was quite unusual: after two years as a navy electronic technician at the end of World War II,

Ed Nather addressing the Workshop

he returned to college and graduated at the age of twenty without a formal major, but with most of his academic work in English.

He worked as a nuclear physicist, also without formal training, at the Hanford Atomic works in central Washington, and at other US government research laboratories including the General Atomic in southern California.

He worked also for two computer firms, where he designed and wrote Fortran compilers for their small computers.

Just prior to joining the UT Astronomy Department, he was Technical Director of the Nuclear Instrument Division of Beckman Instruments.

He early realized he could teach himself what he needed to know, and when digital computers appeared, he learned how to design them and how to program them. This proved invaluable when he introduced this technique in astronomy by opening the high frequency time domain with all its treasures we enjoy today.

His nose for discoveries – he is really a first class explorer – led to the creation of an informal, science driven, open and global network, where people interact with people, not with institutions or governments. This is the Whole Earth Telescope. Not everybody can work in such a network. We have to trust each other to do

the right observations at the right time, with the right equipment, with limited funds and difficult conditions in the field. But we do it because we are inspired by the discoveries continuously done, and the knowledge that a technological genius like Ed will watch the quality of our data and teach us how to do things right. We are also sure he will keep his eyes open for technology of the future to be introduced when appropriate.

During the first WET workshop in Austin, Texas in November 1991, a banquet was held to celebrate his 65th birthday. Many speeches were given in honour of Ed by his collaborators from all over the world. Three of these speeches, which tell us about how the high speed photometry started, and something about Ed as a person, are included below.

2. Speech given by B. Warner

Department of Astronomy, University of Cape Town

R. Edward Nather (he hates to be called Roy) is an unusual person in many ways. Perhaps the first is that he writes very well despite having obtained a BA in English. This first degree launched him into a career as a science fiction author who only later in his life began to write about, and do, science. (One can name a few who, unwittingly, have reversed this sequence). Another rare property is that, from his earliest self-taught knowledge of electronics, he rose to be one of the leading electronic design engineers in the USA. The route took him through a support role at a nuclear accelerator, via photomultiplier design, pioneering software design, to become the technical and research Director of one of the top US electronic companies.

Disenchantment with the industrial rat-race led Ed to seek a different life style – one in which he could apply his skills in astronomy, which to that time had been a hobby. A visit behind the scenes at Mt. Palomar led to the realisation that, to quote his deadly accurate, if mildly inmodest, assessment that "they need me". However, a job application was unsuccessful and loss for Palomar was gain for Texas: in 1967 he took a position in which for the first year he was required to sort out the mess in the control system of the new 107-inch telescope. After that a move into astronomical research was expected. It so happened that I also joined the UT Astronomy Department in 1967 but was absent at the McDonald Observatory on the day

when the Department photograph that now hangs in the Peridier Library was taken. I was hired as a coude spectroscopist and practised that art until mid-1968, when Ed and I struck up a friendship. The Department at that time was very small, so that it was hardly possible not to know everybody – except, of course, that the radio astronomers hardly talked to the optical astronomers, and the planetary astronomers did not know what the stellar astronomers were doing, who in turn did not know what was going on in extragalactic studies. Thank goodness, it is not like that now.

Ed described to me the equipment he had set up, at Harlan Smith's request, to look at optical candidates of the newly discovered radio pulsars. The search was unsuccessful, and it looked as if the equipment would be shelved. But fortunately I knew of the photometry that had recently been done on cataclysmic variables by Merle Walker. So we decided to collaborate.

Our enthusiasm was such that we could not wait for dark time to be assigned in the next observing schedule, so I converted my next coude run to a cassegrain one. Thus it was that, in August 1968, Ed and I began our joint high speed photometric careers during the bright of the Moon – and we have never looked down since.

I am sure that, although I was the only stellar astronomer in the Department at that time, if I had not been around, Ed would have teamed up with one of the other observers and would have founded some other branch of modern astronomy. So I cannot take any credit for Ed's sudden nova eruption into observational astronomy. On the other hand, I have always thought that my most important contribution to American astronomy was a result of drinking with the right people: through regular visits to beer halls with the graduate students I kept myself well informed on what the Faculty were really doing, and also what the students were thinking. My acceptance at these events by the students was not so surprising – after all, I was younger than most of the students in the Department at that time.

And at one of these sessions I learned that the students were thinking that Rob Robinson, who even the Faculty had begun to notice might be worth watching, was quietly going out of his mind with the boredom of qualifying courses etc. So, artfully bumping into Rob in the corridor (I still have a vivid impression of the occasion), I invited him along on Ed's and my next run. One look at the on-line production of light curves and Rob was hooked for life. He may since have had regrets, but I am sure that American astronomy has not.

Ed's and my involvement in our chosen collaboration was a strong interaction. I tried to pass on some of my background in astrophysics and he tried to educate me in electronics. The outcome is well-known and very ambiguous, for Ed has long been a Professor of Astronomy – and I still do not know any electronics.

On the other hand, our involvement in Departmental funding was very decidedly a weak interaction. We saw tens or hundreds of thousands of dollars flowing past in the direction of electronographic cameras, Josephson detectors etc., but could not obtain funding even at the level of the quantum fluctuations in this flow. Ours was in the tradition of DIY* shoestring research, using any equipment at hand, suitably modified by Ed's electronic wizardry. What funding we had was bled from my NSF spectroscopy grant or from funding outside the Department.

A very important grant, whose influence far outweighed its monetary value, was one obtained from the Research Corporation of America, with matching funds from the University. The small fraction of this grant that Ed and I actually got our hands on (it was awarded in recognition of our confirmation of the Crab optical pulsar) was used by Ed to purchase the first Data General Nova. Having bought it to replace the 400-channel analyser that we had been using up until then, I expected to see it applied immediately to the telescope. But no – it sat for months on the table between Ed's and my desks (we shared an office – later with Wayne Van Citters as well). Every time I mentioned the Nova, Ed would mutter new words like "interface board" and "software" which apparently the machine was not equipped with.

When the interface board did appear, it turned out, as we have since learned to expect, to be a pioneering creation, the design published and copied extensively. Only years later did Ed tell me that this design was his first venture into a large scale integrated circuit design – prior to that, all was transistors, resistors etc., all very discretely done.

McDonald Observatory at that time was barely out of the BC era – that is, the Before Counting era. The environment was very unfriendly to pulse counting – what with giant mercury rectifiers converting the incoming a.c. to 100 volts d.c., which was then switched in the form of hundreds of amps rotating the dome, and even many amps a few millimeters below one's finger tips on the hand

* DIY – do it yourself

paddle, and dimmable neon indicator lamps that radiated megahertz signals; and separate grounding systems for the telescope and the control room, which set up terrible ground loops – it was no wonder that our photometer was so wrapped in aluminium foil it looked completely oven-ready.

Then there was the Nova computer itself, which, as we had only one, had to be carried from Austin to McDonald and back for each run – which it did not like, so it meant losing at least half of the first night (and sometimes the whole night) of every run while Ed trouble-shot the thing. A frequent remedy was to take every board out of the machine and run a pencil eraser along the gold-plated connection pins. I took this kind of forefront knowledge with me, when I started Nova-based photometry at Cape Town.

Part of the story of High Speed Astronomical Photometry and its development of McDonald Observatory is told in a book of that name – which is by far the best, and only, book on the subject. Much of what I presumptuously call the "human" side of the story is not published, or publishable in our lifetime.

In researching this historic contribution I looked back at the letters I received from mid-1968 to mid-1972 when I left the Department. (It happens that I have kept every personal letter sent to me since I was 14 years old). During those 4 years, when Ed and I were engrossed in wrestling with what for both of us was a new discipline, I received just 4 letters on the subject – all asking about our observations of the Crab Pulsar in early 1969. This shows the almost total isolation in which we worked – not that we would not have shared knowledge if the occasion had arisen, but I think we were hardly aware of what was being done also at Princeton, Mounts Wilson & Palomar and Cambridge. Be that as it may, Ed certainly laid the most solid foundations, because none of the other groups continued with High Speed Photometry beyond the mid-1970s, whereas UT is still at it – and so are several other observatories around the world to which the technique was exported.

It was this foundation that enabled the Whole Earth Telescope to be easily put into action when the need arose.

3. Speech given by R. E. Robinson

Department of Astronomy, University of Texas

I have worked with Ed Nather for a long time. Our first observing run together was in November 1970, when I was still a graduate student, and we published our first paper together in November 1971, exactly 20 years ago. Brian Warner was the first author on the paper. In the paper we analyzed observations of an interesting but obscure star called BD +16°516. We have co-authored 37 papers since then. Most were published over an eight or ten year period centered around 1980, but the most recent one was submitted last summer, this time with Chris Clemens as the first author. The paper discusses the interesting and famous star V471 Tauri. BD +16°516, the subject of our first paper, and V471 Tauri, the subject of our last paper, are the same star. Twenty years later we are still working on the same star! As Ed has noted, we only add stars to our observing list. We never take them off.

Many astronomers have worked with Ed as students, post-docs, or colleagues. And while few have known Ed for 20 years, most have known him for a long time and call him a friend. Why has Ed collected so many friends? The glib answer, the wrong answer, is that Ed makes great instruments and we want to use them. Ed does make great instruments, but so do other people. There are two reasons why people begin to work with Ed and then stick with him. The first is that he has a deep understanding, a deep insight into what makes good research in astronomy. This is an intangible quality akin to wisdom, and like wisdom, it cannot be taught. You either have it or you do not. How did Ed see the potential in the pulsating white dwarfs when he advised John McGraw to study them for his dissertation back in 1974? With that advice he founded a whole new field of research. What insight led him to propose the Whole Earth Telescope? A student once asked Ed how he chose his research projects. Ed looked at the student seriously and demanded "Find unique stars and study them". That is like saying "The way to make money on the stock market is to buy low and sell high!" A few rare people have this insight and understanding: most do not. Ed has them.

The second reason is that Ed is a special human being. Everyone can see his enthusiasm and energy. Whatever he does, whether it is teaching, research, or fighting administrative battles, it gets his full attention, his full enthusiasm, his full energy. His energy and

enthusiasm are infectious and addictive. This is what first attracts people to Ed. His energy multiplies theirs. There is another side to Ed, a side that is hard to see unless you have worked closely with him for a long time. To those who have become part of his astronomical family, Ed is totally loyal and generous. He is loyal to his colleagues as people, not just as scientists. To get through 20 years with your colleagues, you need that kind of loyalty and generosity, sometimes mixed with humour, always with understanding.

It has been great working with Ed for these 20 years. I hope and expect that we can be colleagues for another 20 years and another 37 papers. If so, I predict that 20 years from now we will be writing yet a third paper on "The Interesting Star BD +16°516".

4. Speech given by S. O. Kepler

Instituto de Fisica, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brasil.

To me Ed has always been a source of crystallizing scientific concepts and a person communicating science clearly. He can always describe complex concepts in terms that everyone could understand.

He has been an example of dedication and hard work. I always remember at the Observatory, on all clouded nights, Ed working all night long developing software, not because he needed to, like us graduate students, but because he wanted to.

Ed always gives you support and respect in every situation. During the morning presentation today, Ed said that he looked at a few constant stars. At least once it was not intentional. We had once an 8 day run at McDonald, and only the end of the last night was clear. We were trying to confirm a variable star John McGraw had found, and we looked for four hours at a constant star! I had marked the wrong star on the finding chart! I thought then my career as an astronomer was over, but Ed gave me all the support; it was OK, we could use the observations to calibrate the atmospheric noise, he said just to make me feel better, since he had done that many times already.

Thank you Ed for all your support!