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***Reminiscing on four decades of friendship  
and looking to an uncertain future***

My dear Jurek, much appreciated colleague and friend:

It is a real pleasure to be 'here' with you, albeit in ethereal form, to celebrate your 85<sup>th</sup> anniversary. Being almost 80 myself, I am prone to say -as general McArthur once did- that "old soldiers never die, they just slowly fade away". Well, this applies to most people in our age bracket, but definitely not to you. Even if, to use your own words, our age implies that we sit on a time bomb, it is clear to everyone that you are truly fireproof: only ten days ago you posted in the e-arXives v2 of a paper, written with Richard (Kerner) also present here, on quarks and colour SU(3) entangled with  $Z_3$ -graded Lorentz algebra.

If my memory does not betray me, we first met at a pleasant *Group Theoretical Methods in Physics* conference in Cocoyoc, in México, in the early summer of 1980; exactly 41 years ago. There, we decided to meet again, and you came to Valencia the following year. You gave a few talks on supersymmetry and mentioned a then popular pseudoclassical particle model (as superparticle models where then called), the Casalbuoni model. I had been earlier interested in group extension theory, and the role of mass in the extended D=4 superPoincaré *group* as characterizing its central extensions and the corresponding two-cocycle soon came up. All this is trivial now, but the then famous Haag-Łopuszanski-Sohnius theorem classifying *all possible generators of Supersymmetries of the S-matrix*, including central charges in supersymmetry *algebras*, had appeared in 1975 (by the way, I have very nice memories of Jan Łopuszanski, whom I met in Wrocław). Well, we started discussing with my former student V. Aldaya and, finally, both of us tackled the problem and the potential one-form of the two-cocycle was seen to provide the term accounting properly for the mass in the superparticle Lagrangian. This led to our first joint paper, *Supersymmetric particles with internal symmetries and central charges*, a 1982 PLB one, which showed the complete analogy between the appearance of the nonrelativistic mass characterizing the central extensions of the Galilei group and the fermion mass in the central extensions of the extended superPoincaré group. I mention this paper because it was our first one and it soon gave rise to other papers in Valencia and in Wrocław on various aspects of superparticle models in different dimensions. Also, it turned out relevant for some future work, in which the Chevalley-Eilenberg cohomology was applied to characterize the WZ terms of the  $p$ -branes of the old brane scan in a 1989 Cambridge PRL paper by Paul Townsend and me, soon to be followed by another one on the topological extensions of the supersymmetry algebra for extended objects and, later on and in Valencia, by the

idea of fields-extended superspaces democracy. You see, Jurek, that I was fortunate meeting you in Cocoyoc.

I ask now for forgiveness in case you are expecting a physics or mathematics talk. But this is the 'old friends' section of the Jurekfest, and so I will allow myself to reminisce on four decades of friendship, on our encounters and conversations, and to speculate a bit on the future. Jurek came to Valencia on many occasions, and I visited Wrocław a number of times too; all the visits were usually productive. Having found common interests, we also met and collaborated in other places: Trieste, Prague, Dubna, Helsinki, Bordeaux and others. All in all, we wrote together or with other friends and colleagues around 30 papers on various subjects. Quite often Jurek would suggest a problem worth looking at. Jurek not only had (has!) a fine instinct and an excellent memory; he was also a fast writer. Usually, once a preliminary idea had proven itself successful, he would soon provide the draft of a paper to be discussed, argued on and modified back and forth, polished and, let me comment in passing, cured of Jurek's slavish neglect for articles.

I also enjoyed the warm atmosphere of the Karpacz Winter Schools. My first one was in 1983; it was devoted to *Supersymmetry and Supergravity* and organized by Bartosz Milewski, a Jurek student; our common friend Wojtek Zakrzewski attended it too (by the way, I met Bartosz again in Seattle in 1991, where he was happily working for Microsoft). I liked the location of the school, the night excursion through the snow with torches towards a refuge up in the mountain, where some comforting drinks would be waiting for us. The atmosphere and location of the Krokus buildings in Karpacz, then belonging to Wrocław University, was also very pleasant; I understand that they were sold many years ago, a real pity. Both at the Institute in Wrocław and in the Karpacz Schools I had the impression that Jurek (or perhaps just his charming spirit) exerted a soft but unquestioned leadership that made things run smoothly in spite of the difficulties in these old times. And indeed, there were difficulties of many types in Poland in the eighties, although it seemed to me that they were endured with great dignity. I recall Jaruzelski's martial law, who knows if avoiding something worse, the forbidden Solidarność movement and so on. All this made a deep impression on me, coming myself from a country that had accessed to democracy not so many years earlier. I particularly recall an open, but obviously clandestine night ceremony to the memory of father Popiełuszko that I witnessed at a public garden, soon after he was killed in 1984. But all these things, like Franco's dictatorship in Spain, now belong happily to a distant past.

Let me come back to you, Jurek. I believe that you have reasons to be satisfied today. You have lead a successful scientific life, had many students, collaborated with many people, including of course the 'old friends' Wojtek and Richard here, whom I also happen to know. In fact, I first met Richard in Poland; Wojtek is a very old friend. I met him in Cambridge more than half a century ago, in 1969, when I was a very young post-doc at DAMTP and he was there a slightly younger research student. He will no doubt remember that DAMTP was then literally dominated by the creed of the analytic S-matrix approach which, I confess, I was not passionate about. It seemed somewhat incongruous to me to develop a theory basing much of

it on the analytical properties of amplitudes that were obtained through the very quantum field theory that the S-matrix approach aimed to replace. Of course the standard model vindicated QFT long ago and the analytic S-matrix theory has lost its old prominence. Well, you see that my memories run disorderly when I look back at my younger years.

Of course, physics aside, it was always a pleasure to discuss with Jurek on other subjects, either at lunch at the Sciences Campus cafeteria in Valencia or in the Wrocław mensa. Other equally suitable places were the Kalambur Art Café in Wrocław or the Grotowski club in the city's main square. In fact, Jurek told me there that in his youth he even thought of following a playwright writer career, not too strange on account of his charm and vivid personality, but finally his passion for physics won the day. Our conversations wandered from physics to politics very easily. I found them both pleasant and interesting, exposing me to the more Eastern perspective of a well-travelled person. So much so, in fact, that I occasionally would tell Jurek that he was the wandering Pole in analogy with the Flying Dutch. Nevertheless, it seemed to me that for him Poland was always the country to return to, the Wrocław Institute of Theoretical Physics his permanent scientific home and, finally, that Wrocław was the city of his family. I hope, Jurek, that your wife Elżbieta is watching: I send my best wishes to her. Ela, I would like you to know that I still keep your beautiful and truly professional photographs.

Let me go on as if Jurek and I were having one of our conversations. Perhaps the last one was on Brexit. As he knows, I am a bit of an anglophile (further, I have a British son), so you will understand my sadness when on June 23, 2016 –five years ago- UK voted herself out of the EU by a ridiculously narrow margin of 3.8%. I believe that Brexit has been a disgrace for all Europeans, as Jurek (and Wojtek) surely agree. Although this negligible 3.8% was judged decisive, in my view it just proved that anumerism runs high in modern societies in general and among politicians in particular. As a cartoon in the Spanish newspaper El País said: “when the campaign flashlights were switched off people could finally see, but then it was too late”. I understand that most British scientists were for Remain rather than Brexit: even the President of the Royal Society, chemistry Nobel prizewinner Sir Venki Ramakrishnan, wrote to prevent activating the EU's Art. 50 that ultimately led to Brexit. Europe will pay dearly –is paying already- the anumerism that did not appreciate that a mere 3.8% is much too small to produce such terribly disruptive and irreversible changes. Anyway, if questions like these should be settled by referendum, a qualified majority should be required as implied for instance by the Canadian Clarity Act (2000) motivated by the Quebec referendums.

Other topic of our conversations was nationalism. I would argue with Jurek that an extreme nationalist is just a biologically primitive person whose primitivism has not been tempered by a liberal education. From an evolutionary, Darwinian approach to human nature this is an inescapable conclusion: nationalism is the result of the instinctive fixation to the environment in the earlier period of life. Surely, Jurek, you remember the photograph of Konrad Lorenz, one of the founders of ethology, being

blindly followed by newly hatched goslings. Of course humans are not geese, but nevertheless extreme nationalisms are just the result of the instinctive (hence innate and therefore primitive) humans attachment to their early environments. This imprinting (*prägung*, as Lorenz called it) in the early period of life, when not tempered by a liberal education correcting rather than reinforcing it, is the essence of nationalism, unfortunately advancing in many places in Europe today. Under our apparently civilized skin, we are showing again our more primitive traits, and nothing good may come from it: as philosopher Jorge Santayana said, “those who cannot remember the past are condemned to repeat it”. *Sapere aude*.

So, what may be waiting for us, my dear Jurek? We all know of climatic change, greenhouse gases, mountains of waste, of plastics and microplastics contamination of the oceans, of dying of coral reefs and so on. You of course know how difficult is to make predictions, especially about the future, but I'll risk it in the spirit of our old discussions. We have now entered the Anthropocene, a term coined by the atmospheric chemist and Nobel prize winner Paul J. Crutzen, who incidentally died last January. The name emphasizes that we live in an epoch characterized by an extreme human pressure on the planet. It is easy to see why introducing this new epoch, distinct from the Holocene one, is appropriate. Consider, as just *one* example, the body mass of all terrestrial vertebrates. According to a report from Club of Rome headed by physicist and biologist Ernst Ulrich von Weizsäcker (son of the famous physicist –and philosopher- Carl Friedrich von Weizsäcker), the distribution is as follows: a full 67% corresponds to farm animals (and pets), 30% to humans and a mere 3% to wild life. In other words, almost all -97%- of the whole biomass is associated with *homo sapiens*. And how many of us are here? Today we number 7700 millions (during or lifetimes, Jurek, the planet population has been multiplied by more than three) and, according to the United Nations, human population will reach the terrific amount of 11200 million people by the turn of the century. This spells disaster and leads to an unescapable conclusion: *the real problem is us*; we are the primary cause of all others. Our relation with mother Nature should be defined as toxic. Is there a solution? It is pointless to speak of sustainable development: this is now a *contradictio in terminis*. May be we should try reaching the ‘stationary state economy’ considered by John Stuart Mill in his famous *Principles of Political Economy* that appeared in 1848, just 12 years before Darwin's *Origin*. But this will not be possible before population itself is harnessed and, of course, before allowing developing countries to reach a decent level of life too. Is society willing to accept the serious sacrifices needed? This is unlikely because, as Pascal once said (and his famous aphorism has again a simple Darwinian explanation), *le cœur a ses raisons que la raison ne connaît point*, particularly when these reasons will imply great sacrifices. But if we want to survive as a species, we have to save ourselves from ourselves; otherwise, we are bound to die from success.

Thus, what does the future has in stock for us? I am rather pessimistic, albeit not for us; the future will not have time to catch you and me. But it will bring very serious problems for the next generations, already showing symptoms of

restlessness although not really perceiving the true magnitude of the difficulties they will have to face. Of course, if there is a solution, Science will be an essential part of it: in fact, without Science there will be no future (think today of the vaccines against COVID-19). But, in the meantime, and as persons who, rather than hiding, would prefer to go to the top of a mountain to enjoy the best view of a comet on collision course with Earth, allow me to conclude with a light joke. In it, a young priest visits an old retired Archbishop to congratulate him on his 90<sup>th</sup> anniversary. In so doing, he says: "I wish you to reach your 100<sup>th</sup> anniversary". Then, the Archbishop replies with a wide smile: "many thanks, my son, but do not put any limits to the Divine Providence". So, my dear Jurek, let us agree on this: do not put yourself any limits either and, in the meantime, go on enjoying your successful life. *Carpe diem*.

Many thanks to all of you for listening.

A handwritten signature in blue ink, reading 'José Adolfo de Azcárraga'. The signature is written in a cursive style with a long horizontal stroke extending to the right.

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