

## Conversation with Rainer Küschall, August 2011

When I was sixteen years old I broke my neck in a diving accident in a swimming pool; that was in July 1963. In those days in Switzerland nobody knew anything about spinal cord injuries. I was simply sent to the big area hospital where my family lived and put on my back; I lay there for six months. My injury meant that I was now a quadriplegic with seeming no movement in either my arms or legs. I was told - and I believed - that it was just a matter of time before I would die. They even sent in the priest to convert me to Catholicism so that my soul would go to heaven. Then in that December they said they had to move me out. The hospital was up in the Alps and they were emptying the beds in anticipation of all the skiing injuries they would get in the winter season. So then I was sent on to a smaller convent hospital run by nuns where everyone expected I would soon die.

But the previous winter I had met a German girl when we were both skiing and we had become friends. We had kept in touch and then after my accident she had come looking for me and eventually she tracked me down to the nuns' hospital. She came in and saw me lying there on my back, no movement in my hands or feet; I was nothing. But she said to me, 'You can't go on like this; I will do something'. And she went away and she found out about Stoke Mandeville Hospital and the treatment there. Then my step parents got all the people in my village together and raised money for me and finally, 18 months after my accident, in December 1964, I was flown to England.

I remember that journey so well because it was quite strange. I was carried onto an ordinary passenger plane from which they had removed several rows of seats so that I could be laid on the floor on a very thin mattress. I was lying there totally naked just covered with a thin towel - and this was mid-winter - and all around me there were normal passengers in their seats looking at me; I remember finding it very embarrassing. But then when we landed at London I remember being left on the plane while all the other passengers disembarked and looking out of the window. And it was so strange, because right opposite there was another plane loading up; and all around it were people in wheelchairs; and they were laughing and smiling in the snow. It was the very first time I had seen people in wheelchairs; and there were so many of them and they seemed happy. I remember thinking, what is this wheel chair city I have come to? I discovered afterwards that it was the British team going off to one of the winter wheelchair games. But it was such a peculiar coincidence for me to see them and it felt like a good omen.

So then I went to Stoke Mandeville for three months; that was all the money that had been raised would allow for. The first big shock was being turned on my bed every three hours. For the last eighteen months I had simply been immobile on my back and I was stiff like a wooden blade. No one had done this in Switzerland and of course it hurt incredibly! So much so that I fainted and collapsed from the pain. I had my first meeting with Dr. Guttmann a few days later. I remember he was really interested in me and in taking care of me; he reflected a kind of fatherly emotional situation. Then after his examination I was sent to a physiotherapist. A few weeks later he came back to me and said. 'Rainer, I am not going to try and kid you about any miracle cures. The only thing I will be able to do for you is to get you so that instead of lying on your back you can sit up in a wheel chair.' And that is the first thing I learnt to do. It was really hard; I felt like I wanted to die, I hadn't sat up for so long that all the blood ran out of my arms and went into my feet.

I had this fantastic physiotherapist, Margaret Roberts, "Robby" and she made me do all this stuff but it was so hard and painful for me. There was one occasion when she brought me back after physiotherapy had finished at the end of the afternoon. Normally she would lift me back into my chair and wheel me back onto the ward. But this time she just left me in my chair in the corridor outside the ward and went away. Everyone else had gone too; they were turning off the lights and I was still just sitting in the dark outside the ward. She had never ever done this before. There was no one about and I was stranded in the corridor I was unable to propel myself in the wheelchair; I had no use in my fingers so I couldn't hold the wheel rims. Finally, after what seemed like hours, I worked out how to push my thumbs into the spokes. Although I had no use in my thumbs either, I was able to wedge them inbetween the spokes of my wheels and then push down with my arm muscles to propel the chair forward. So just one spoke at a time, with my thumbs, I slowly pushed myself onto the ward. It was so hard and it took ages; at the end of it my thumbs were bleeding.

I was so angry with Robby that he next time I was with her, maybe it was the next day at physiotherapy, I wanted to kill her. I put my arm round her neck, - again I couldn't use my fingers - and I tried to squeeze her, to strangle her with my arm because I was so angry about what had happened. But she just laughed and smiled at me. I was amazed and I said, 'Why are you doing this, smiling?' And she told me that it was the first time she had seen me try to do anything for myself, so it was good, it was progress. And then I realised that the whole episode of my being left in the corridor must have been deliberate, to make me make an effort, to come up with a solution.

After three months at Stoke I felt at home. I had learnt to wash myself and shave and I was pushing myself around in a wheelchair having now learnt how to put my thumbs into the spokes. And then there was the sport. It was really strange in this wheelchair world, meeting all the others, seeing the paraplegics flying around the wards at great speed in their chairs. But as a quadriplegic they started me out on archery. They had to tie my body to the back rest of the chair to support it; then they strapped the bow to the left hand; then they strapped a hook to my right hand; at the end of it I was so tied and strapped up that I couldn't find a way to hold the arrow! So I tried table tennis instead and I learnt how to spin the ball and that became my world.

One Friday evening one of the physiotherapists pushed me out to the local pub, the Bell in Stoke Mandeville. It was winter and she wrapped me up in jackets and blankets - though compared to Switzerland it wasn't so cold. But I remember it as a magical evening; it was the first time in two years I had been outside at night and seen the stars in the sky. And we went into the Bell and I saw all these jars of pickled eggs and onions on the counter - that I had never seen before - and I drank a dark brown, sweet beer - the like of which I had never tasted before. It was a sudden and great pleasure. So I started looking forward to being alive for the first time. And afterwards it was an adventure for us; a bunch of us would try and go there on a Friday or Saturday evening. It became THE challenge to find ourselves a way to get to the Bell; sometimes a freshly-injured paraplegic would push me with my minor help; it was the first WIN in my new life!

Then the time came for me to leave Stoke Mandeville. My step-parents had converted their house for me back home; but I had no idea how I was going to manage. I got on well with one of the orderlies on the ward, an Italian called Dominic, and I suggested to him that we could pay him to come back to Switzerland and look after me; and he agreed. Back home he would look after me, push me to the cinema and take me back to my old school haunts. But none of my old friends

wanted to know me anymore. I felt terrible back there, so we went and tried living in a chalet up in the mountains, but that didn't work either. Then in the winter we went to Spain for three months. Finally Dominic told me that he was home sick and wanted to go back to his girlfriend at Stoke Mandeville.

So I went into a handicapped home. It was the only one in Switzerland at the time and it was the other side of the country and a nine hour drive from my step-parents. Also it wasn't just for disabled people but included people with all different sorts of physical and mental handicap. I had my own room there, a physiotherapist and a job paying 5 francs a week; and basically I lived there for the next 12 years. Every day there I played table tennis. I saw it as my way out of the ghetto of disability, my ticket back into the world. I lived for the next game, the next tournament. I only thought about training, playing, getting into the next ranking. I made it into the national team and then got to go to international games.

When I was 29 I finished my education and I moved into a modern home where I was nursed and you were also able to work. For the first time I was earning proper money and in my room there was my own telephone. It was the first time I had had a phone and I was so excited. But then I thought who's going to call? Nobody knows me or my number; and I don't know anyone.

Then three or four months later I met a girl and we fell in love and she took me out of this ghetto world; we moved into a flat in town and started to live a normal life. I had just taken part in the Tel Aviv Olympics; there had been an interview with me in the local paper and because of that a man phoned up and offered me a job. He came round in a beautiful Bristol luxury car too check me out; I was very nervous. His was one of the first companies importing computer printers from Japan and I was there to do all the purchase ordering. But I had to write and type and file forms without any movement in my hands; it was incredibly difficult for me; at the end of each day I was exhausted and had to go to bed at 6 o'clock in the evening. There were all sorts of other practical problems too; the lift to the office was so small that my chair's wheels pressed against the wall when it was moving and lifted my chair off the ground. After 3 weeks I had to leave.

So I had taken the decision to quit; the question was what was I going to do now? Well, I had a very old Everest and Jennings chair tucked away in the spare room. I said to my girlfriend, "Go and get it for me". "What are you going to do with it?" "Never mind that, just go and get it." I had it on the dining room table in pieces for three weeks while I simply studied it. And as I looked and looked at it the idea came to me that I was going to build wheelchairs. I had learned from my own problems and from watching the paraplegics pushing themselves around in their heavy hospital chairs and by now I understood something about balance and about ergonomics. So I thought there are some technical possibilities here to improve the dynamics of this machine.

### **Wheelchair design**

It's very difficult for other people to understand the feelings of a quadriplegic because our world is so limited and so small. It's as if you have left your body and are disconnected from the physical world, just observing everything from high up. You feel that just so long as your heart is pumping and you can move a finger then you are OK. You are so physically helpless, but your brain is working.

Because of this I was never interested in the able-bodied world. What I wanted was to be a paraplegic; I watched them doing their active sports and I admired their muscles, their speed, their energy, their upper body strength and the fact that they don't hurt all the time. Whereas we quads, we are panting if we push our chair for 20 metres. They have it seemingly so easy, whereas for us it is so hard. The difference between a quad and a paraplegic is a hundred times greater than that between a paraplegic and an able bodied person. Those paraplegics who were closest to us and who trained with us felt ashamed because they knew we were working so hard to keep up.

But above all what I admired about the paras was their manoeuvrability. What I needed most of all was to find a way to be independent like them. This was the single motivation which took me into wheel chair design. Ultimately it would be about being able to design chairs for myself that would allow me to become independent. But when I started off what I was doing was designing chairs for paraplegics.

At that time you couldn't adjust the setting of a wheelchair. But I developed this metal block for the rear axle, about 3" x 5", that was drilled with 9 to 12 holes. It was welded onto the frame edge where the old axle was fixed and then re-chromed. This allowed you to raise or lower the height of the chair and change the position of the back wheels, forward or back. I called it the 'Varioblock' and I was the first person in the world to enable these changes to the axle position.

I found a garage mechanic who wanted to do some extra work in the evenings and we would work like idiots all night, modifying existing wheel chairs. People were amazed and my disabled friends began asking me to customise their chairs. I started off doing things like cutting down the cross members and adjusting the chair, chopping bits out from the top crossbars which then shortened the top cross and produced a negative wheel camber.

Then another friend asked me to build him a new chair; not only that, he gave me \$1000 to do it. And that was my start-up capital for what became the business. So I built him this chair, with a Varioblock and I chopped the leg rests to make it shorter and I re-chromed it and I got a friend who was bike builder to paint it – and it was exquisite, burgundy red and high-polished chrome. And the man I made it for still has it and tells me it's the best chair he ever had.

Once I had made a few chairs for friends then orders started coming in. I began by ordering spare parts from Everest and Jennings in England and adapting those. They understood what I was doing and sent me pre-chromed parts so I didn't have to waste time by removing the chrome, doing the work and then re-chroming or painting it. But then after a while their rep. came to see me and he said, "We have noticed that we are not selling so many of our chairs in Switzerland since you started buying our spare parts". I think he had seen one of my chairs using their components. So he said, "We can't deliver to you anymore because you are now starting to be our competitor."

And the business just developed from there. The first chair I designed and built from scratch (rather than from modified parts) was the Slalom chair. I did things like doing away with the swing-away and I replaced the footrest with a textile strap – that saved 10 kilos – about 40% of the weight of an average chair. This was 1979 or 1980. I was still building in steel then (later on I would move to stainless and then to aluminium) and these were exciting, pioneer times. I remember my first big order when we had 27 chairs new stacked up in the living room waiting to go.

I always wanted the person to be seen rather than the chair. I always remembered the way that the old hospital wheelchairs were so large and visually dominant that they ended up concealing the person sitting in them. So one of the things I tried to do was to take everything unnecessary away from the chair; to make it minimal so that it ended up as just a seating position.

In 1985 came the Competition chair for Basketball. Kuschall America had just opened up that year and over 50% of the winning US team at the next World Championships ended up using that chair; it was the fastest and the lightest in the world. They even put one in the Museum of Modern Art in New York because of its minimal design, its logical simplicity and its technical and aesthetic beauty.

Then a year later in 1986 I designed the Champion chair: that was all modular components with lots of variables (there were I think 127 different positions) and no welding, everything just plugged in. It was an incredibly minimal design, reducing the volume of the chair by 60%; it was also the first chair with a horizontal folding mechanism. For me personally one of the big things was to be able to load and unload my chair from my car. Earlier folding chairs never folded completely flat, so I was never able to stow them in the passenger seat of the car on my own. Whenever I wanted to go down the café or do something in town I always had to ask someone to help me. Previously a wheelchair's cross-members had always been vertical, so they stuck up when folded; on this chair I made them horizontal so they folded completely flat. So for the first time I was able to go out with my chair in the car when I wanted, on my own, without having to worry about whether there were other people to help me.

We had also started building racing wheelchairs. My first employee was Frantz Nietlispach; he was an old table-tennis friend and an incomplete paraplegic and I started off by building chairs for him to race in; each change I made in the designs brought him faster times in his races. He first competed at the Olympics at Arnhem in 1980 where he took one gold and then he won 5 gold medals at Stoke Mandeville in 1984.

## **Sport**

My first sport had been table tennis. I was good; I won gold at Heidelberg in 1972 and Toronto in 1976. Back in the 1960s nobody had believed that quads were physically able to compete at wheelchair racing, but then in the 1970s they first introduced a 60 metre race for quads at the games.

And at about the same time they finally created sub-classifications within quadriplegics. Previously there had just been one class for all quads when they competed. I am what they call a high quad, C4, C5, C6; I have no feeling in my right shoulder and my right arm is flawed. I have my left arm working, but no quads or triceps. Within this new classification I competed at class 1a which is the highest (most disabled) class in the classification. The next class is 1b where you have full arm and chest movement but no fingers; and then 1c where you can move fingers as well. But I remember that in my first games at Stoke Mandeville in 1967 there was only the one quad classification. That meant that and I had to play table tennis against a French man who was disabled by polio and who had some leg movements, full body control, no wheelchair back rest at all and was not tied in with a bandage like I was. Yet we were the same classification! So the new classification made it fairer and encouraged competition.

All of this encouraged me to take up wheelchair racing and I started building chairs for myself in aluminium. I had had no idea before of its super lightness; it is such a strange material, very light and fragile. I first entered the 60 metres at Arnhem in 1980; but in that Olympics it didn't work for me doing both table tennis and racing, so after that I dropped the table tennis to concentrate on the racing and that became my new passion. I was training at my hospital in underground wards; racing up and down and crashing into the walls.

When they had set up that first 60 metre quad race category in the wheelchair games in the 1970s The reason it was such a short distance was because Guttmann maintained that quadriplegics would collapse if they tried to race over any greater distance (part of the quadriplegic condition is an inability to raise your blood pressure). What Guttmann said went at the time, so for a while the only race distance for quads was the 60 metres. After a few years that attitude shifted and longer distances were introduced: 100, 200 and then the 400 and on up to 5,000 and eventually the Marathon.

I started off racing over sprint distances. I was able to turn my arms extremely fast but because of my C4 / C5 condition I didn't have much muscle strength so I could never power a good start. So I was never able to get the 100 meter world record for that distance. But over longer distances – 200, 400, 800, 5000 I had the time to make up for what I lost in the start and I ended up breaking all the world records for those distances. So then I started to concentrate on the longer distance. The German Heine Köberle was my hero at the time; he was the first quad athlete to move across from middle distance races and start competing in the Marathon. So then I did that too; I got fascinated by the idea of the distance.

That move into distance racing was partly determined by my condition. I didn't have the muscles for power or for acceleration and because of my anaerobic condition caused by low blood pressure I couldn't maintain effort for long periods. So I developed a technique that combined using a very small diameter push ring on my chair (which was a bit like using a very small back cog on a bike) with an interval technique for racing where I would push really hard for a bit and then have to pause and rest while waiting for the blood to flow back into my muscles and then push again. By using the high gearing I got from the small push ring I could achieve a very high speed and then it was less effort to maintain it during the intervals of recovery. This technique worked well for distance races where my speed allowed me to catch up on the dozen metres that I would typically lose at the beginning of a race from my slower starting and high gearing.

What I also discovered when I was training was that if you had a very full bladder when you were racing then it was painful; and that this pain creates adrenaline and the adrenaline has the effect of raising blood pressure. It gave me goose bumps and made me start sweating and, more importantly, it made me go like a rocket. And I was the first quad to discover this phenomenon. I would start to sweat and feel like a superman; my arms were going full and my muscles started growing. And then I started training with interval technique, pushing really hard for a burst and then pausing to let my muscles recover; and then that got reflected in my wheelchair designs as it meant I needed a chair that would maximise the free-rolling dynamic – and that wasn't just about good wheel bearings; it was about alignment and weight distribution.

Later on all the quad athletes worked out this connection between pain, adrenaline and performance. Then you would get some athletes putting sharp things in their chair seat that pressed

against the sacral bone to give them pain when they were racing. It became common for racers to swallow litres of water before a race so that they would be bursting as they raced - I well remember following someone in a race and his pee splashing in my face from in front. Other quad athletes used to put a catheter into their bladder and then clamp it shut so the pressure built up that way. Basically all of these techniques had the effect of opening up the capillaries and increasing the blood flow to the muscles. It was a form of 'biological doping' and so eventually all these practices were banned in competition and the race officials would check our chair seats afterwards and if they were wet then you would be disqualified. I remember winning one 5,000 metres race and getting disqualified for that; not because I had peed myself – in fact I had splashed a glass of water over my face to cool down and my seat was wet from that, but I still lost the race (and the world title) because of it.

It took me six years but finally I got the marathon world record. I was training twice a day by then, 22 hours a week, getting up at dawn and doing 10 mile sessions before going to work. I had been struggling with getting a good racing position and I was getting really fed up – I felt like giving up. But then a miracle happened; I changed a few angles on my chair; I had been using a Velcro strap to hold my chest down lower; and suddenly it all came right and I was able to push my top speed up from 16 to 24 km per hour.

While I was racing Marathons one of my biggest emotions was the time I passed through the Brandenburgertor in the Berlin Marathon and going into the newly-opened East Germany - this was 1990, just after the fall of the Berlin Wall. And I thought about Papa Guttmann and the time back at Stoke Mandeville when he had said to me, "Rainer, the best you can do in the future is just being able to get you to sit up in a wheelchair". At the time he had told me this I would be quite unable to even push a wheelchair – and he had never suggested that I would be able to race in one. And now here I was leading in a Marathon! It gave me goose bumps just thinking about it there. As I passed through the Brandenburg Gate it was as if I was going through my own personal gate into a new world.

It had already taken me three years training to break my 3 hour record. Then at Heidelberg in 1991 I did a world record time of 2 hours 26 minutes. The race took place in a thunderstorm which was actually good for me as it cooled me down and I was overtaking people in the pouring rain. I think the greatest thing for me there was actually overtaking some paraplegics. Some of them were so angry when I did that – being overtaken by a quad! – that they just gave up, took off their gloves and left the track.

For the 1992 Paralympics at Barcelona I knew it was going to be hot so I had designed myself a pumped water spray with a nozzle that was positioned on my chest that allowed me to cool myself down. With the water bottle underneath it added half a kilo to my total weight but I reckoned it would be worth it. At the time I had a moustache and it took a while for me to realise that the pump wasn't working as efficiently because the water was getting trapped in the moustache – so I shaved that off. I spent months training on rollers for that race. I had also changed the design of my chair so that the position of my legs was underneath me; that way I was 30% lower in the chair than my competitors. I was the only one of the quads racing at Barcelona in that position. I was also the first quad to use a full titanium chair in that year.

But in the end I only got silver. It was my own fault; I was too arrogant. You know I didn't even take the sightseeing bus around the Marathon route in advance to check out the gradients. Unusually there was a big climb right at the end of the race and then one final hair pin bend. My big competitor in that race was the German Heine Köberle. I knew that I should be able to beat him in the sprint at the end but I hadn't bargained on that final climb and in the end he was much stronger and he took me in the final 20 metres just before the hairpin bend; he took me inch by inch. As usual I had got a very small diameter push frame on for that race – good for the flat, but not designed for that final climb – and in the end Heine rolled in front of me by a few metres and I took silver. That was my last Olympics; I came away with six medals but no wins.