Hillary Hauser:

Hannes Keller

Diving Pioneer and Renaissance Man

Hannes Keller, the Swiss mathematician, philosopher, pianist, computer wizard – and first man on earth to dive to 1,000 feet – had called me from Zurich to tell me how he celebrated his 60th birthday; his imaginative wife Esther had given him a ticket to fly a Russian Suchoz 27 fighter plane, the big brother of the MIG-29. Before he flew to Russia, however, Esther had made certain that Hannes had made out his last will and testament. He thought that was a pretty good joke. He also found humour in flying the Russian fighter plane 30 feet off the ground at 400 miles per hour, banking, following a river. "I have always looked at fish with a fork in my hand," Keller said. "This time the fish in the river were looking at me with a fork in *their* hand!" With that recollection, Hannes got a severe case of the giggles, which he always does when he thinks of a recent, wild exploit.

It seems most fitting that the man who revolutionised deep-sea diving turned to space-age flying to celebrate turning 60.

In today's world divers are stepping out of diving bells at fantastic depths and the reason they are able to do this has a lot to do with Keller's early diving experiments. He revolutionised diving and the science of underwater exploration just as Neil Armstrong's first step on the moon revolutionised space exploration. The Swiss adventurer's earth-rattling dive to 1,020 feet off Catalina Island, California, on December 3 1962 was years before its time, launching a new age of deep-sea discovery long before there were fancy titles attached to big programs. It was so revolutionary that everyone, including oil companies worldwide – and Jacques Cousteau – wanted to know how Keller did it. It was not a deep-diving stunt such as some have claimed, but a complicated, scientifically worked-out scheme to get man on the bottom of the sea. Until 1975, Keller remained the only person anywhere, ever, to have personally touched the ocean floor at that depth.

What made him do it? The dive was filled with terrible risks. No one had done it, no one knew for certain what would happen. It was impossible. He was a guinea pig. It could have killed him. It did kill his diving partner; it even killed one of his safety divers. Keller not only survived, he emerged from his diving bell victorious,

and although the event was greatly sobered by the surrounding tragedies, it proved a human could reach that depth.

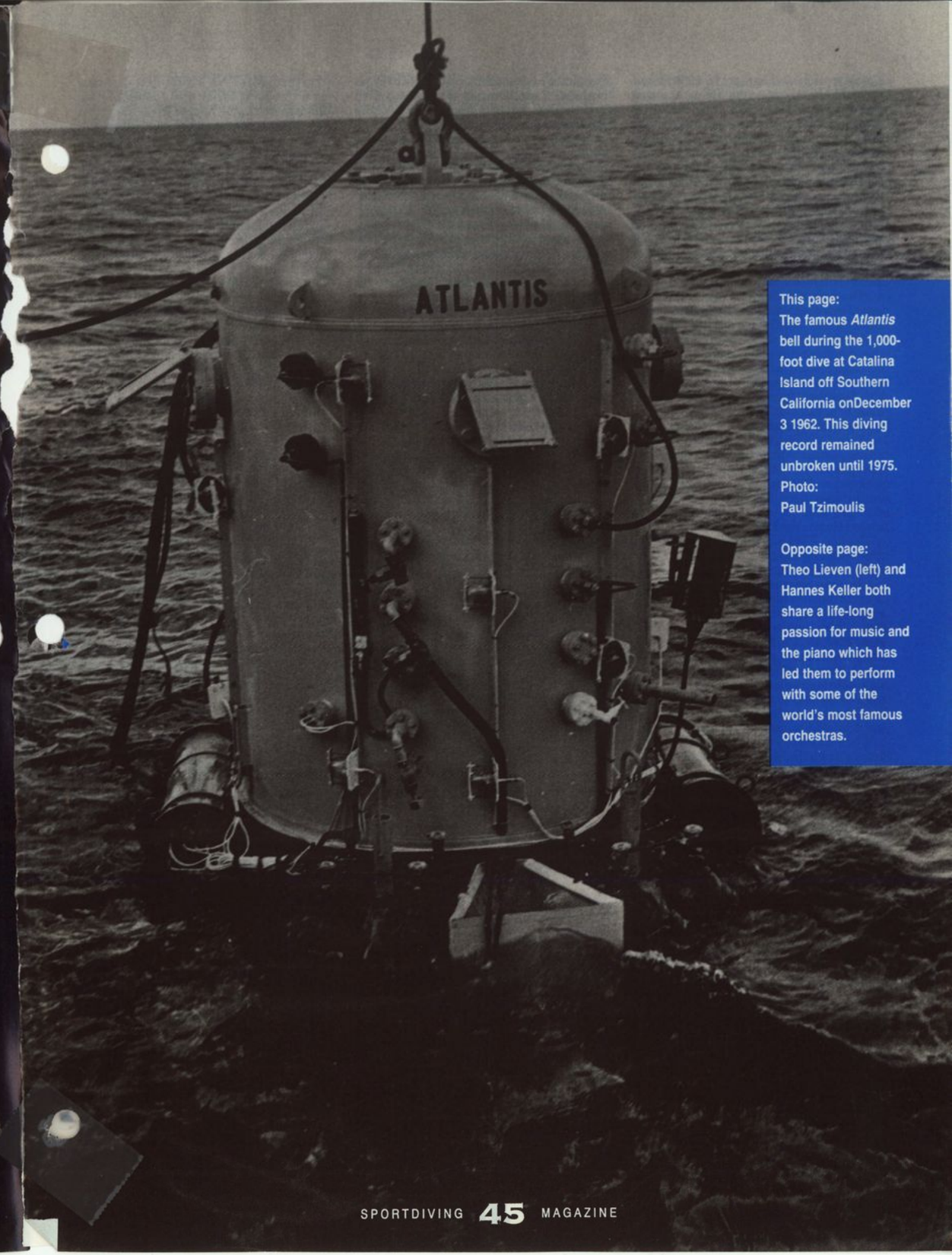
I first met Hannes in 1968, when a previous husband of mine received a contract from a major American publisher to write a book about Hannes' life. I was a young bride of 24 and my then-husband Dick Anderson was the surviving safety diver on Keller's 1,000 foot dive. After flying for what seemed like years from Los Angeles to Zurich, Keller met us and drove us to his home, which was somewhere in a cow-filled countryside outside Winterthur, about 30 kilometres northeast of Zurich. He was born here in 1934, the youngest of four children; of all of them, he would make the biggest noise in the world.My first meeting with Hannes had very little to do with the deep-diving feat that had rendered him a national hero in Switzerland. It was about six years after his dive and Keller still held the world record; he must have been about 34 at the time. He was the same then as now – full of smiles and schemes, plots and plans, and a ridiculous energy that has increased rather than diminished .

Dick and I dropped our bags in the front hall and climbed the stairs to his living room where a big Steinway grand piano occupied the main wall. I took one look and I asked the fateful question, "Hannes! Do you play?" I had studied and loved and played the piano all my life. In answer, Hannes sat down and launched dramatically into something by Mozart, then Brahms, Beethoven, Schumann, Bach, Rachmaninoff and Liszt ... and so many more. He played a lot, I played some, and Dick passed out on the floor, asleep. I think we quit at 4 am; 26 years later, Hannes and I laugh like mad at the memory, for we have played and played like this a number of times with our mates in various states of disrepair. Music, specifically the piano, is a large part of his personality and goes hand in hand with every stunt and heroic feat he has ever performed. Playing the piano perfectly always puts him to the extreme test. Hannes grew up with two sisters and a brother in a home filled with music. He started playing piano at age 11, mixing this up with boyhood pranks and experiments that eventually led him to serious philosophy and mathematics study at university level. He became a mathematics teacher.

Dick and I got to work. We interviewed Hannes and his friends and associates. We talked to Albert Bühlmann, the scientist who at his *lungenfunktion* laboratory at the University of Zurich who had worked with Keller on the development of the procedures and gas formulas for the deep dives. We went to Lausanne to talk to Jacques Piccard, we talked to people everywhere, and bit by bit we pieced together a story.

Hannes Keller is forever curious, willing to try anything no matter how great the risk, or how wild the scheme. He thrives on challenge. Something that captures his interest becomes subject to his extreme

"I can fly a jet, I can fly at 40,000 feet altitude, I can do acrobatics at 3,000 feet! I can do turns, I can do loops, I can fly back to the base and land! The risk was horrifying, it was totally crazy ..."



This page:
The famous *Atlantis* bell during the 1,000-foot dive at Catalina Island off Southern California onDecember 3 1962. This diving record remained unbroken until 1975.
Photo:
Paul Tzimoulis

Opposite page:
Theo Lieven (left) and Hannes Keller both share a life-long passion for music and the piano which has led them to perform with some of the world's most famous orchestras.

concentration and energy. In 1959 someone told him about scuba diving and that was all it took. He built his own breathing device out of wood, which "worked very bad," he told *Life Magazine*, and almost immediately after that he decided to work on diving problems. He went to Dr Bühlmann with some of his ideas. Bühlmann, a physiologist, had been working on the problems of pressure on the human body, but (as I recall Bühlmann saying) he was thinking of man in space rather than man in the deep sea. Keller's entry into his life at this point must have seemed diametrically prophetic to him.

The pair started working on the problem of nitrogen narcosis – not only responsible for the "bends" but also for a diver's inability to think or do anything clearly in the deep sea. It also requires lengthy decompression, which in those days was almost always impractical or even impossible. One has to remember that George Bond's "saturation" diving techniques had not been thought of yet.

Keller and Bühlmann had a theory that nitrogen narcosis might not be caused by nitrogen at all. With this in mind they planned a 400-foot dive wherein Keller would breathe a mixture of 95 percent nitrogen and 5% oxygen. This dive was staged November 1959 in the Lake of Zurich. Using a 50-gallon oil drum (costing $1) for a diving bell, Keller went to the bottom breathing the nitrogen mix from inside the drum, which had been weighted with stones. To re-surface, all he had to do was cut the stones off with a knife. While everyone above gloried in this Giant Leap for Diver-kind, Keller was 400 feet below, out of sight from everyone, throwing up from fear and struggling to cut the weights off his makeshift diving bell. The discomforts became small details when Keller emerged victorious.

A major testing ground for the Keller/Bühlmann team was to get a diver down and back in a short time. In 1956 Wookey of the Royal Navyworld undertook a record dive to 600 feet, but that dive had required 12 hours of decompression. Keller and Bühlmann got to work on their next project: to hit 700 feet and surface within an hour. Working with a computer at the IBM centre in Zurich, the two then developed 400 secret tables involving secret gas mixtures for use to various depths to 1,312 feet. After testing these calculations on himself in high-pressure laboratory tanks in Toulon and Washington DC, Keller was ready. The dive took place on June 28 1961 in Lake Maggiore, a border lake between Switzerland and Italy. Keller's diving companion was Ken MacLeish of *Life Magazine*, who was there for the adventure and to write a story. With a floating armada of spectators surrounding a giant diving platform anchored just off the lakefront town of Brissago, Keller and MacLeish were lowered on a diving stage. Wearing drysuits and rubber helmets with built-in faceplates and mouthpieces, the two divers breathed a combination of gases supplied to them from tall tanks lashed vertically to the frame of their diving stage.

They were to start and finish the dive with pure oxygen. Below 50 feet they would breathe three different mixtures containing some oxygen, which would be greatly reduced for the deepest part of the dive. According to MacLeish's *Life Magazine* account, Keller guaranteed that neither one of them would suffer nitrogen narcosis.

The divers started descending. At 30 feet they switched from oxygen to the first gas. 50 metres, gas change, 55 metres, gas change. Each change was done for both men by Keller, who plugged a free terminal of each air line into an outlet on the tanks, then disconnected the drop lines that had supplied the previous gas. At 100 metres the divers stopped to switch to the deep-water mixture. MacLeish later wrote: *"This time the change is extreme. There is barely enough 'air' to breathe and it is bitter cold, even colder than the ice water in which we now hover. My teeth itch. I try to say OK but cannot manage it. Still, it appears that I can live on what we are getting."*

One hundred and fifty metres ...160...170...180...210 metres, 215, 220 metres – 728 ft – in 7 minutes 30 seconds.

Opposite page: Hannes Keller thrives on risk and challenge; his wizardry with computers led him to develop software which translates languages and corrects spelling as it is keyed in
This page: Author Hillary Hauser, left, and Hannes Keller celebrate following Keller's performance with Zubin Mehta and the American Youth Symphony

On the way up, the divers stopped at 160 feet to switch gases. Over their earphones they now heard music piped from the surface to given them something to decompress by. At 50 feet MacLeish noticed blood and foam in Keller's mask – an ear squeeze. At 30 feet they switched to oxygen, sitting on the stage for a while, then exercising and kicking in place to stay warm.

One hour after they had begun the dive, the divers were on the surface. Official depth – 728 feet. MacLeish's story hit the August 4 1961 issue of *Life Magazine*, which had John F. Kennedy on the cover with his quote, *"Any dangerous spot is tenable if brave men will make it so."*

Now, international oil companies became greatly interested in Keller's experiments, for in the greater depths of the world's oceans were vast untapped treasures of oil. No matter how sophisticated robotic arms and manipulators might become, the human hand was – and is – the most important instrument for delicate situations, such as the workings of valves and flanges.

Shell Oil leaped at the chance to finance Keller's next dive – the big one – to 1,000 feet. Out of it, Shell would receive Keller's secret technology and thereby become an instant frontrunner in offshore oil exploration. Keller and Bühlmann extended their computerised formula of gases and a site was chosen – Catalina Island off Southern California, where the ocean floor drops precipitously from the shoreline into a deep ocean trench. Keller's diving partner was the British photojournalist Peter Small, a co-founder of the British Sub Aqua Club. Their vehicle was the diving bell *Atlantis*, which would be lowered from a surface support ship that carried a technical team to monitor gases and maintain contact with the divers by surface-to-bell phones. Also onboard was one team of safety divers, Dick Anderson and Chris Whittaker. In retrospect no one could figure out why there were only two safety divers, but hindsight is always sharp when a disaster occurs.

On December 3 1962 the dive commenced. Keller and Small entered *Atlantis* and the hatch was closed. The chamber was hoisted over the support ship's side and began its rapid plunge to the bottom, stopping at various stages for the switching of gases as had been done during the Lake Maggiore dive. At 12:35 pm the divers reached the bottom at 1,028 ft. As planned, the divers switched from the gas mixture inside the bell to another gas mixture supplied to them through air hoses to their faceplates. Keller opened the hatch of the *Atlantis* and the two went out briefly, just long enough to plant a flag of victory on the ocean floor, then they returned to the bell.

Here Hannes himself relates what happened:

"Here I did the most stupid thing I ever did. I opened a Swiss flag in front of the TV camera, not knowing that just then the video-recorder ran out of tape! Then I found my head entangled in wet fabric and spent minutes to free myself. Patriotism was long gone and I threw the damned flag away and got the hell back into the diving bell. Then the gas supply stopped. I started emergency procedures;

1 To prevent suffocation I opened my face mask

2 To prevent drowning I opened all gas supplies to shoot the water out of the bell. With the low gas pressure this was slow.

3 To prevent falling out of the bell I closed the hatch. Because I could not wait for all the water being blown out I kept the door a bit open by putting a swim fin under the lid.

4 The next things would have been for me to connect the main supply and close my face-mask again, which would have taken five seconds. I did not get those. Instead I got the full effect of breathing air at 300 metres (we did not have helium in the bell. The effect must have been dramatic convulsions.

The deck crew saw everthing on the TV camera. They told Peter Small what he should do. He stared at me and was totally frozen For two minutes he must have been in a mental shock. He did not reconnect to the gas supply – he stayed on his backpack. When it was empty, he began to suffocate inside his suit, while all around him was air and oxygen in abundance."

With Peter dying and Keller unconscious, the bell began its ascent to the surface. At 200 feet it stopped because the surface support team saw the chamber was not pressurising. There was a leak. A continued rise would surely subject both divers to severe bends or air embolism. Safety divers Anderson and Whittaker were sent down to look for leaks. Anderson checked everything but found nothing. They came back to the surface to report. Al Tillman, who was on the support team, told Anderson that the bell was not pressurising in any case, and there had to be a leak. At this point it was noticed that Whittaker had blown up his life vest, had blood in his mask and was ordered out of the water. Anderson, meanwhile, prepared to dive again.

Instead of leaving the water, Whittaker took his diving knife, slashed his vest to deflate it, and dived with Anderson back to the bell. This time, Anderson closely scanned the bottom hatch of the *Atlantis* and discovered a small trail of bubbles escaping from the circular hatch. He discovered the tip of a swim fin caught in the hatch, which held it open a fraction of an inch. He motioned to Whittaker for his knife and used the blade to push the obstruction clear of the seal. The hatch closed completely, but the seal still leaked. Anderson pulled down on the hatch and motioned for Whittaker to swim to the surface to give a signal for the chamber to be raised. He planned to stay and hold the hatch to make sure it sealed. Whittaker signalled that he got the message and started up. Anderson waited and waited, his decompression meter entering the red zone. Finally, he had to leave. The minute he surfaced, a crewman asked Anderson the horrible question: "Where's Chris?" Whittaker was never seen again.

Meanwhile, the leak from the *Atlantis* had stopped because the different pressures inside and outside the chamber had shifted. The chamber continued on its way to the surface and Keller regained consciousness. Seeing that Small had not opened his faceplate, Keller opened it and began an intensive resuscitation attempt on the unconscious diver. But Small was dead by the time they got to the surface. Keller suffered no ill effects at all.

The dive was an awful paradox. It was a success because one man had made a 1,000 foot dive and lived, proving that the mysterious mixture of gases had worked. It was also a disaster because of the deaths involved. No one knew whether to cheer or boo. The effect was the same as if Neil Armstrong had landed on the moon and lived, while fellow astronaut Buzz Aldrin had not made it back to earth. In that case, would the moon landing have been considered a success or failure?

In the case of Keller's dive, no one knew for sure. Some press reports called him Hannes *Killer*, while others (including Jacques Cousteau) denounced him for not sharing his secret gases and dive formula with the scientific community. However soon after the dive Bühlmann *had* published the details of Keller's dive, although few people (including Cousteau) had read that highly technical report; scientific papers tend to circulate only among the scientists who know where to find them. The diving community ignored everything and called Keller a hero. So did the Swiss.

The book on Keller was never finished because Dick felt he couldn't sort out the absolute facts of the dive without question. But I stayed in touch with Keller over the years and after Dick and I separated I saw Keller again in 1973. He had been asked to appear at a large diving congress in Anaheim, California – he still held the world record for a deep dive, a record which was unbroken until June 1975.

As Keller's host, I invited some people to my home to meet him, including Scott Carpenter, the US astronaut who at the time was an aquanaut in the US Navy's *Sealab II* programme, Dr Joe MacInnis, who was to be the first man to dive underneath the North Pole, Paul Tzimoulis, publisher of *Skin Diver* Magazine, and also my neighbour Goldy McJohn, the keyboard player of the *Steppenwolf* rock group.

Keller and I organised a piano programme for our guests. He played Beethoven and Bach and I played Brahms and Liszt. We played Schumann and those wonderful nocturnes of Chopin. His performance was breathtaking. No one spoke or moved, but immediately afterward Joe MacInnis uncorked the champagne and we all cheered the glories of music. It was raining, my house leaked, and the water seemed to pour through the ceiling into our glasses.

Back in Europe, Keller worked on a design for a deep sea diving suit, but designed, instead, the tight-fitting ski suit that eventually adorned Spider Sabich and the Swiss Olympic ski team. He then premiered a pianist who couldn't speak, he said, but who would play from unpublished manuscripts by Mozart and Beethoven. Keller circulated the rumour that the manuscripts had been given to the pianist years before by some obscure Russian count who had found them in his attic. Then, in a Zurich concert hall jammed with music lovers and experts from all over the world, Keller took the stage at intermission and announced that the compositions were really those of the pianist. The whole exercise, Keller said, was to prove that music critics didn't really know what they were talking about. I remember a lunch in San Francisco when Keller asked world-great underwater cinematographer Al Giddings