Messages from Modern Inventors to the Next Generation

9. *ASIMO* - Mr. Toru Takenaka, Senior Chief Engineer, Fundamental Technology Research Center, Honda R&D Co., Ltd.

Isn't it true that ASIMO comes to the mind of many people when they hear the word "robot"? Even those who are not familiar with the name ASIMO certainly would have seen the white robot that walks on two feet on TV and other media.

ASIMO has been playing an active role as a robot that represents Honda Motor Co., Ltd. (Honda) and Japan for ten years. But Honda has conducted research on robots for more than twenty years, since before ASIMO was born.

Mr. Takenaka who since childhood dreamed of developing robots, joined the robot project team at the time Honda started developing robots and realized his childhood dream at Honda.

What inspired you to become an inventor/researcher?

I have loved machines that move since I was in elementary school. I was often so absorbed in making plastic models that move with a spring or a motor that I forgot to eat meals. I enjoyed taking apart old electrical appliances and once couldn't restore a malfunctioning clock I completely took apart.

At that time, robot cartoons such as "Astro Boy" (Mighty Atom) were very popular and I had a desire to become a robot researcher like Dr. Ochanomizu. At university I studied control engineering (study on ways to make things move automatically) in Professor Masahiro Mori's laboratory. Professor Mori, a leading robotic scientist taught me "how we should relate to things" and "what it means to create things".

In 1989, the year I joined Honda, the fact that the company was conducting a research on robots was kept a secret. Although I was surprised to learn that I would be making a study of robots as I assumed I would be conducting a research on automobile control, I have been carrying out research on humanoid robots ever since then as my true vocation.

What specific ideas and difficulties have you faced as an inventor/researcher?

At the time I started participating in the robot project at Honda, it was taken for granted to create a solid robot using firm material in order to stabilize a robot. But in those days, the robot used to lose its balance and fall down from the impact of landing when there were small bumps on the floor or when it attempted to walk fast.

So we changed our approach and put soft rubber or sponge on the sole of the robot's foot to soften the impact of landing. However, when soft material was used, the robot became unstable and couldn't even walk one step. We didn't give up and tried one way after another for six months and the robot became able to walk on a floor that has bumps of 1cm in height at the rate of 3 kilometers an hour (about the same speed as walking while enjoying a conversation).

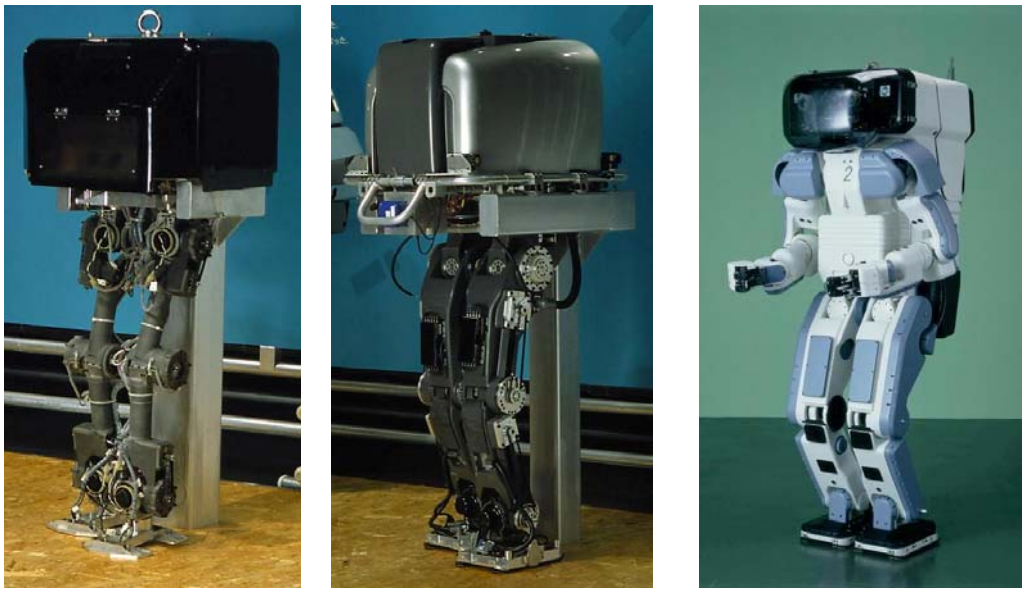
We tried to devise a new walking mechanism that would enable the robot to walk more smoothly. In addition to the way people normally walk, we used as hints movement of gymnasts, how people place their weight when making a turn on skis, and movement of taking a big step forward saying "Oops!" when a person almost falls down. I thought about the walking mechanism not only during working hours but sometimes while playing sports on holidays. We eventually came to understand that the robot becomes more stable if we took advantage of the collapsing movement rather than persist on not letting the robot topple. This realization led to a new invention.

What gives you joy as an inventor/researcher?

One day we were putting to test a control method of letting the robot gently put its foot on the floor to cope with the uneven floor to keep its footing and change the length of stride when it became impossible to keep its footing. I became excited with the sense of achievement of "finally succeeding!", when the robot that used to lose balance walking over a bump of 1cm in height, walked over a bump of 4cm in height as if it were nothing. We were conducting the test on the first floor of a building but I ran up to the second floor laboratory where my colleagues were working and involuntarily shouted "It walked!" Then the whole project team together performed the test again. All the project team members who supported the project shared the joy of success with each

other.

The joy I felt when I came up with the idea for the control method used for ASIMO in the company cafeteria and the pleasure I felt seeing the audience being surprised and delighted watching ASIMO walk when it was shown to the public for the first time, were both things I was able to experience definitely because I had kept on working hard as a researcher. I believe the sense of hard-earned achievement is an ineffable thing that only those who have experienced it can understand. I hope that you will also keep on trying all the way in your field of interest and be able to feel such a sense of achievement.



Evolution of robot models leading up to ASIMO (in order from left to right) “E2”: Model in 1989, at the time Mr. Takenaka participated in the project, “E6”: Model that cleared a bump of 4cm in height, and “P2”: The first humanoid robot Honda unveiled.

What message would you like to give to the next generation?

Just listening to what people say does not cause new ideas to be generated. It is necessary to always think deeply and broadly about things and to get into the habit of generating new ideas even if they are small. Things that seemed similar begin to look different and the same common things come into sight for things that seemed different. Then new ideas will begin to naturally emerge. Needless to say, not all of these ideas will work out and some of them will result in failures. That is why you can feel the greatest joy when you achieve your goal or realize your dream. Try to do a variety of things to have fun and to learn things and foster your ability to think deeply and broadly about things. Furthermore, have trust in yourself and keep going till the end, in order to realize your dream.

Humans and robots are good at different things. In addition to doing work instead of humans, I would like humans and robots to work and create something together by making full use of their respective skills. That is to say, I would like to create a robot that makes people feel lively and become creative when it is close by. I am looking forward to the opportunity where we can engage in making a study and developing such a robot and feel the joy of success together.

Mr. Takenaka standing beside ASIMO