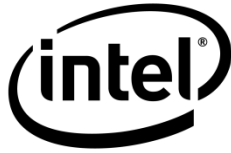**Intel Corporation**
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Feature Release

NOTE TO EDITORS: Photos, videos and more facts available at
http://www.intel.com/pressroom/kits/innovation

Intel Celebrates 50th Anniversary of Integrated Circuit; Intel CTO Makes Technology Predictions in Honor of Inventor's Day

NATIONAL INVENTOR'S DAY, Santa Clara, Feb. 11, 2009 – Celebrating National Inventor's Day today, Intel Corporation recognizes the 50th anniversary of one of the greatest inventions of our time: the integrated circuit. In 1959, inventor Robert Noyce, who later became one of the founders of Intel, created the first planar integrated circuit made from silicon. Noyce's invention consisted of a complete electronic circuit inside a small silicon chip and helped revolutionize Silicon Valley's semiconductor industry. Virtually all integrated circuits made today use some form of Noyce's manufacturing technique.

Integrated circuits are based on the earlier invention of the transistor by Bell Labs in 1947. The transistor quickly found its way into radios, telephones and televisions with each transistor being separately manufactured and packaged, making electronic products bigger, less reliable and more power hungry than expected. Early integrated circuits allowed several transistors to be put onto a single, rectangular piece of silicon – or "chip" – that could be manufactured cheaply and in very high volumes. Today, a single chip might contain more than 2 billion transistors.

Integrated circuits are now used everywhere from computers, cars and TVs to music players, cellular phones and kitchen appliances – even some greeting cards contain them. Without Noyce's invention, untold numbers of today's products, processes, services, devices and conveniences would be impossible, as electronic circuits would still consist of discrete

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components that would take too much space, consume too much power and be too unreliable to be practical.

"Noyce created what became the mainstream manufacturing process for fabricating integrated circuits on silicon wafers," said Justin Rattner, Intel Senior Fellow and chief technology officer. "Without Noyce's idea for a planar integrated circuit using silicon, humankind would not be where it is today. The silicon integrated circuit is used in almost all electronic equipment and can truly be said to have revolutionized the world of electronics."

Inventing Today for Big Gains Tomorrow

In honor of Inventor's Day, Intel took a look behind the scenes at Intel Labs to see what electronic technology may look like in the coming years to improve the lives of everyone on the planet. From sensing technology and machine perception to harvesting free energy and shape shifting, tomorrow's computing capabilities will look like something only imagined in science fiction books and movies. Needless to say, we are nearer everyday to when this fiction will become reality. More than that, the pace of technological innovation is, in fact, accelerating. The sheer number of inventions in the next 40 years will equal or surpass all of the inventive activity that has taken place over the last 10,000 years of human history.

Advances in chip technology are paving the way for many new applications. Intel envisions billions of connected people and trillions of connected electronic products. We are approaching an age where a single chip can routinely process more than a trillion arithmetic operations in a second. Such "teraFLOPS" computing devices will sequence our genes in a matter of minutes or provide doctors with real-time CAT scan images, or 3-D images, of the internal structures of our bodies. Because of technological innovation led by Intel in multicore, or "many-core" chips, new kinds of consumer and professional products will process high volumes of information in short amounts of time while consuming less energy.

Rattner revealed five predictions for how technology innovation in the areas of green computing, personal lifestyle, robotics, communications and health might change the world in the years ahead.

#1   **Ultimate in Green Computing**

Advances in power optimization will enable Intel to find new ways to identify and harness sources of power for consumer electronics devices that don't pull from the electrical grid, representing the ultimate in green computing. Imagine devices that will extract "free energy" from the environment, including self-sustaining sensors placed on bridges or in buildings to gather and record stress and strain information. Body heat, radiation from cell towers and even energy created from thumbing through emails on a smart phone may be used to power personal electronics devices instead of a battery. Energy efficiency in future mobile devices such as laptops and netbooks could consume significantly less power, making battery concerns a thing of the past.

#2   **Live, Work and Play Better**

Through advances in Intel multi-core computing and sensor technology, computers may be able to recognize faces, buildings and other objects. Your TV remote control would know who is holding it and automatically bring up a selection of your favorite programs. As future Intel chips scale from a few cores to many, mainstream supercomputers could deliver movie-quality visual computing effects including life-like 3-D environments that you could experience in real-time. With many-cores in your desktop or laptop, the "super smart" computer may turn your bumpy home video into something professional with intelligent editing and automatically generated transition effects.

#3   **Human-Like and Microscopic Robotics**

Today, most robots live on the factory floor where there are no variations to their tasks or environment. Imagine home robots that do more than just vacuum the floor or behave like a pet dinosaur. These future *home-bots* may empty the dishwasher and fold your socks. Most importantly, they may be capable of learning to move and use arbitrary objects, sense and recognize movement around them and learn to adapt to new situations. A sensing technique currently used by fish to electrically "feel" objects without touching them could be used to give the future home-bots the ability to grasp odd-shaped objects without breaking. Not all robots will be life-sized. Some will be too tiny for the naked eye. Imagine millions of these

micro-robots, each called a catom, that would assemble themselves into arbitrarily shaped objects to move, change color and shape all on their own. A handheld computer might fold into a tiny space in your pocket, reassemble itself into the shape of a mobile phone to make a call or send a text, or become large and flat with a keyboard and large display for browsing the Internet.

#4 **Wireless Everything: Carry Small, Live Large**

Ubiquitous wireless technology may allow you to enjoy a "large" experience from your small personal devices. Your phone or mobile Internet device would automatically find and compose itself with other display, storage and compute resources in its vicinity. Video content would stream automatically from your handheld device to the screens in your car or a flat-screen display on the wall of your family room.

#5 **Connected Computing Improves Health Care**

Imagine unobtrusively monitoring a person's health by collecting data that could be used to recognize irregularities in a person's health, gait or daily activities. In a sensor network, dozens, hundreds or even thousands of tiny, battery-powered computers could be scattered throughout a home. Silently, each wireless sensor in this ad hoc network could collect data, including light, temperature, humidity or movement changes. The wireless sensors relay the collected data to their neighboring devices and then to a specified destination where it is processed or sent via the Internet for further analysis. This data could be used to enhance the quality of life for elders by allowing them to stay in their homes instead of moving to institutional care. The data may also help improve healthcare through prevention and early detection of disease, lower healthcare costs and ease the burden on family members and other caregivers. Wireless sensors provide the promise of more than just monitoring human activity. They also may be able to spot behavioral or physical problems that could indicate the onset of disease.

Inventing the Future

All of these technologies are in some stage of active research or development at Intel. "While accurately predicting the future has proven to be extremely difficult, inventing the future is actually much more straightforward," said Rattner. "It's that simple principle that guided Intel inventors both past and present. It can truly be said that the future will be that of our own invention."

About Intel

Intel [NASDAQ: INTC], the world leader in silicon innovation, develops technologies, products and initiatives to continually advance how people work and live. Additional information about Intel is available at www.intel.com/pressroom and blogs.intel.com.

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