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NANOSCIENCE
(Listed by Institute)

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Mooij initiated research in Delft on electronic transport in fabricated nanostructures. He studies non-equilibrium effects in superconductors, single electron effects, dynamics of quantum vortices and more recently superconducting quantum bits.

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Prof. dr. Cees Dekker

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From a background in electronic properties of carbon nanotubes, Dekker's team changed to work on single-molecule biophysics 7 years ago. They employ tools from nanotechnology (AFM, tweezers, nanostructures) to study DNA-protein interactions in DNA repair for example. Nanopores and nanofluidic channels are used to study the dynamics of DNA but also to control microtubules that move on motor proteins. Carbon nanotubes are used as biosensors.

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Paul Alkemade

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Paul Alkemade has shed new light on the formation of nanoscale surface features, such as nano ripples. These features are important because they could be useful as templates for growing other nanostructures.

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Focuses on single-molecule investigations of the molecular machinery of the cell; DNA- and RNA-protein interactions; mechanics of biopolymers; applications of nanotechnology to biophysics.

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Prof. dr. ir. Teun Klapwijk

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Klapwijk's group has the main focus on two subjects. 1. NanoElectronics for Space Research: Non-equilibrium phenomena and quantum noise in mesoscopic systems determine the sensitivity of hot-electron bolometers and superconducting tunnel junctions for space research and 2. Spin
Transport, studying how the interplay between spin and charge of electrons determine the behavior of semiconducting and superconducting materials and electronic devices.

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Prof. dr. Leo Kouwenhoven

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Kouwenhoven's group studies electron transport through metal or semiconducting structures with critical dimensions of a few nanometers. The physics of electron transport in nanostructures is incredibly rich, and at low temperatures, quantum mechanical behavior emerges: the energy levels
in the structures are quantized, just like in atoms and molecules. Our research focusses on understanding and controlling the quantum properties of structures such as superconducting rings, quantum dots, nanowires and carbon nanotubes, with possible application to quantum computing and novel electronics devices.

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Nazarov researchers theoretical research in physics of quantum electronic devices.

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The Photronic Devices group concentrates on the physics of devices operating on the basis of controlling photonic and electronic waves on the nanoscale. In particular, we use photonic bandgap materials and inorganic semiconductors for new optical and electrical device
operation. Phenomena in devices made from these material systems exhibit both interesting similarities and differences, while in either case doping (optical doping and electrical doping, respectively) is essential for device functionality.

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Vandersypen researchers coherent control and entanglement of electron spin states in semiconductor quantum dots.

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Detailed investigations of materials, method development and service-related research. Each of these three types of research has been proven to be very fruitful for the other two. Important methods developments are focused on high-resolution electron energy loss spectroscopy and on
accurate structure determination.

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Herre van der Zant's group studies the electronic, magnetic, and mechanical properties of molecules, assemblies of molecules, and crystals of molecules. Most of the experiments we perform involve a combination of top-down nanotechnology and bottom-up nanotechnology. Top-down nanotechnology is used to build nanometerscale structures that are used
to hold molecules or to make electrical contact to them. Often these measurement structures have a profound effect on the molecular properties. The bottom-up technology they use include synthesizing molecules, purifying them, and using self-assembly techniques to place the molecules between electrodes or to arrange the them into assemblies like fibers or crystals.