‘Technology taken for granted’
The endeavours behind the convenience.

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Introduction

The idea for this project arose from many years working as a senior systems engineer, in the Aerospace, Naval, and Surface Transport industries, where the advanced technologies were developed long before being incorporated into consumer products. Although those involved in the initial scientific discoveries or subsequent developments are well aware of the theories the end user, the consumer, takes the capability or existence for granted and often hardly notices the ‘What’ let alone the ‘How’ or the ‘Why’.

It is proposed to select a number of examples of breakthrough technologies and present these as a series of short articles, suitable for publication in the public domain, perhaps through a reintroduction of a ‘Tomorrow’s World – Today’ television programme, and by extending the content of showcase and market opportunities such as Exploratorium.

Many of the new technologies are disruptive, and this has been true of many scientific breakthroughs throughout history. Where appropriate historic examples or parallels will be included.

Primary Objective

Safeguard our innovative future by encouraging the young to follow a career in science or design engineering by raising awareness of the contribution of scientists and design engineers who provide us with a wide range of labour-saving or life-enhancing products.

Secondary Objective

To bring groundbreaking developments to the attention of the public, and in particular, educators.

Scope – Criteria for inclusion

Technology breakthroughs form the basis for many products that although visible are unseen. For this initial project the examples where possible focus on a process or material science that can exist as a product in its own right such as Coatings, Optics, Materials, The impact of disruptive technologies – and what is meant by the term.

Scope – Criteria for Exclusion

Although it is recognised that incremental developments that have often resulted in significant improvements in systems, such as automotive engine developments leading to more energy efficient cars. These have been excluded at this stage.

Examples

There follows a preliminary selection of scientific and technological breakthroughs

1. Organic Chemistry – Temperature Sensing using Cholesterol Crystals sandwiched in a polymer tape, (example LPG Gas cylinder contents gauge).

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2. Medical – Silver Impregnated bandages – nano-technology (Historic note bactericidal properties of Silver also known to and used by the medieval Knights of St John of Jerusalem in their Hospitals).
3. Biomimetics – Drag reduction, use of polymer sharkskin profile to reduce aircraft drag by 2 – 5% potential savings in fuel equivalent to 0.5% of Through Life Costs.
4. Materials – Bonding of Diamond dust onto metal tool surfaces. Improved tools, more efficient manufacturing processes, energy saving, less swarf (waste). Developed into, initially nail files, kitchen knife sharpeners and other edge tool sharpeners.
5. Chemical/Materials – Thixotropy. Investigation of causes of disastrous mud slides in Scandinavia and understanding of the principles involved led to the development of thixotropic non-spill paints. Paints that remain a gel in the can, until liquefied by the mechanical shock of application.
6. Fibre optics – High bandwidth data communications providing a backbone enabling technology for today’s information society.
7. Fibre optics - Sensors and transducers that require no electrical or external power for operation. Enables remote sensing in hostile or inaccessible environments.
8. Conducive polymers
9. Materials – Hi-flux Magnetics utilising rare earths
10. Materials – Piezo electrics
11. Battery technology
12. Colour change paints – white emulsion paints that are coloured upon application but dry white. Ease of use, material saving.
13. Inorganic Chemistry – Food self-warming and ration packs, utilise mechanical activated phase state initiated by mechanical shock. Also available as Wine Warmers. The process is reversible.
14. Heat shrinkable films and products
15. Toughened Glass - - Safety, reduced product complexity Manufacturing process improvements. Example; Frameless opening windows on Modern Buses.
16. Biomimetics – self-cleaning surfaces, the ‘lotus effect’. This is not a surface coating per se, but is determined by the surface micro-topography.
17. High temperature materials – Silicone rubbers – domestic kitchen utensils, easy release baking trays.
18. Micro electronics - Micro-Electro-Mechanical Systems(MEMS) is the integration of mechanical elements, sensors, actuators, and electronics on a common silicon substrate through microfabrication technology. While the electronics are fabricated using integrated circuit (IC) process sequences (e.g., CMOS, Bipolar, or BICMOS processes), the micromechanical components are fabricated using compatible "micromachining" processes that selectively etch away parts of the silicon wafer or add new structural layers to form the mechanical and electromechanical devices to provide a complete ‘system on a chip thus enabling sensing and actuation in areas hitherto impossible. These range from micron sized accelerometers using Piezo electrics and pressure sensors, in a range of systems from Automotive passenger Airbags to medical continuous diagnostic systems. This last example shows how scientists and engineers working across disciplines combine knowledge to develop life enhancing systems. Diagnoses leading to treatment of Asymptomatic, glaucoma Until now little is known on the cause the glaucoma but current consensus and treatment focus on high or unstable intraocular pressure (IOP). MEMs combined with RFIDs and subminiature processors have been combined to produce this diagnostic system.

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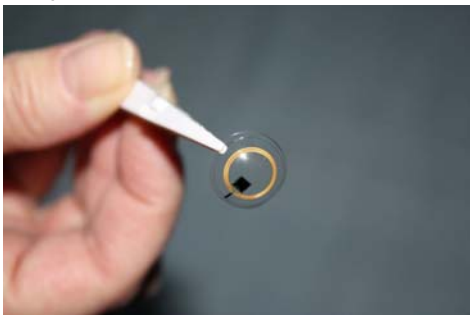

The soft contact lens like sensor, with its MEMS antenna (golden rings), its MEMS sensor (silver ring close to the outer edge), and microprocessor shown here:

19. LASER technology applied to Television projection.
20. Embedded systems and Wearable wireless sensors, lending themselves to continous medical diagnoses.

Lastly – an equivalent historical example. Candle making provides an example of an equivalent 19c technology breakthrough – equally disruptive at the time. Early candles had solid wicks, these needed constant attention because as the candle burnt down the wick material curled over into the outer flame causing the candle to smoke and gutter. These required trimming every few minutes. The invention of a woven wick, which remains vertical, is self-trimming because the top of the wick is carbonised and dispersed as the flame moves down as the candle burns.Interestingly this is also provides us with an example of the oldest unbroken commercial enterprise: **Rathbornes Candles** are the oldest surviving candle manufacturers in the world. They were founded in 1488 in Dublin.