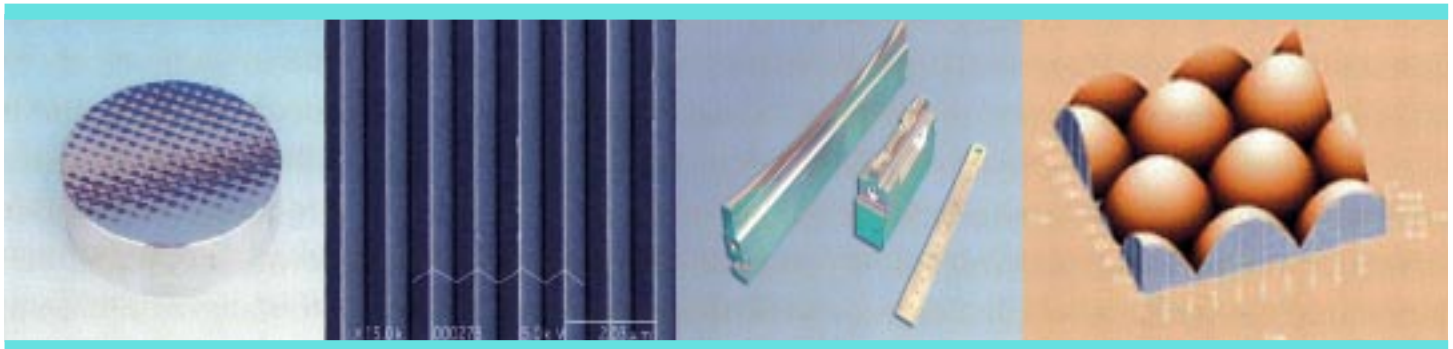
Hi-tech centre to advance opto-electronics



Some of the applications of advanced optics manufacturing technology.

Supported by a $8.2 million grant from the Innovation Technology Fund (ITF) of HKSAR, the Department of Industrial and Systems Engineering has announced its plan to set up an Advanced Optics Manufacturing Centre on PolyU campus.

In view of the fast growing demand for products such as laser printers, hand held scanners, and display and broadband optical fibre connectors, the new facility will help Hong Kong master the cutting-edge technologies much needed in producing critical components for these high-value added photonics and telecommunications products. It will be the first of its kind in Hong Kong focusing on commercial applications and product innovation.

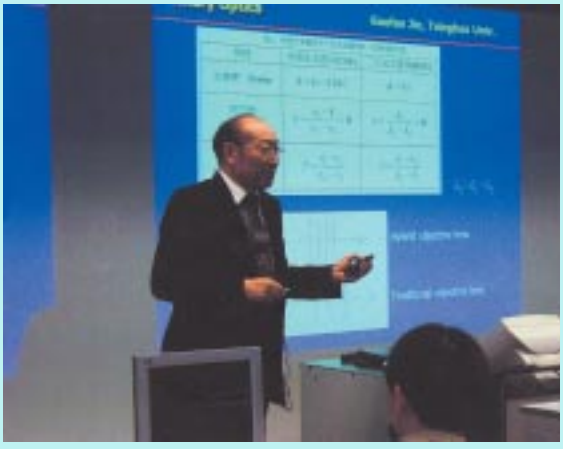
Prof. Lee Wing-bun, Chair Professor and Head of Department of Industrial and Systems Engineering, said: "Five years ago, the Department introduced ultra-precision machining technology in Hong Kong for the design and production of aspheric optics. In this new ITF project, a multi-axis ultra-precision freeform machine will be introduced.

The machine is capable of machining fiber optics connectors, lenses for laser scanners, optical micro-structures for LCD backlights and components for various other products. The technology developed can also further photonics research in Hong Kong. We hope to gradually build up a pool of local expertise and establish Hong Kong's reputation as the regional design centre for opto-electronics."

Freeform optical elements and optical microstructures are key components widely used in photonics and telecommunication products. The fabrication of these novel optical surfaces is based on ultra-precision multi-axis freeform non-conformal machining technology which is currently *not* available in Hong Kong.

This machining technology, based on multi-axis raster milling, microgrooving and grinding, is an enabling technology which provides a solution for machining non-rotational symmetry freeform optical surfaces and optical microstructures with submicrometer form accuracy and nanometric surface finish without the need for any subsequent polishing. To promote the applications of freeform optics, the Centre will develop specific technologies for non-conformal optics part programming and form testing techniques.

Enhancement of the design and manufacturing capability of freeform optics is crucial to Hong Kong in opening up markets for photonics and tele-communication products. It is estimated that the global market for freeform optics will reach $60 billion in value next year. Even a small share of the huge global market will create a strategic demand for the local precision tooling and moulding industry in the manufacture of the critical optical components.



Prof. Jin Guofan of Tsinghua University shares his expert knowledge on optics at a recent seminar on PolyU campus.

Watershed discovery: Sweating dummy makes news headlines

Dr Fan (left) and Mr Chen showing the features of Walter.

Two PolyU textile scientists have successfully developed a new breed of manikin for testing the comfortabililty of various kinds of clothing, especially those for use in extreme environments, such as military uniforms, sportswear and spacesuits.

Not only can the first prototype be dressed in real clothing, but it can also "perspire". Named "Walter", this dummy is jointly developed by Associate Professor Dr Fan Jintu and his PhD student Mr Chen Yisong, both from the Institute of Textiles and Clothing.

The name Walter comes from "water", as a large proportion of 83 per cent of the manikin is made up of water, similar to the human body. Its Chinese name 華特, means uniquely from China, or 中華特有 in Chinese. "Walter is created by Chinese, and so I hope it can be first used for Chinese people," Dr Fan remarked.

The simulation of sweating is one of the toughest challenges in manikin technology. In an article published in the *Journal of Measurement Science and Technology* of the Institute of Physics, the scientists described how Walter's special "skin" can simulate perspiration while his limbs can "walk" for a test.

According to the pair, Walter has many distinct advantages over other existing dummies:

- Walter has a waterproof, but moisture-permeable, fabric "skin" that simulates the evaporation of sweat;
- "Warm-bloodedness" can be simulated in Walter by pumping water at body temperature (37°C) from its centre to the extremities;
- Unlike most existing manikins, it takes only one step to measure the two most important parameters, namely thermal insulation and moisture vapour resistance;
- Walter's skin can be unzipped and interchanged with different versions to simulate different rates of perspiration.

Dr Fan added: "The manikin has showed high accuracy and reproducibility in the measurement of thermal insulation and moisture vapour resistance of clothing.

"It will be extremely useful for better understanding the dynamics of heat and moisture transfer from the human body to the environment, which is the foundation for thermal physiology and environmental engineering."

Supported by $500,000 funding from the Research Grants Council, $300,000 from the University and external funding from W. L. Gore & Associates (Far East) Ltd, the research has attracted widespread attention both locally and abroad.

Walter attracts much interest from the media.

Bio-chemical agent promises cleaner air

With the aim of improving indoor air quality, Prof. Chua Hong has proved that the novel blending of beneficial micro-organisms can effectively control odour and the growth of harmful bacteria.

Prof. Chua showing a sample blend of micro-organisms.

Working in collaboration with an environmental technology company, the Professor, from the Department of Civil and Structural Engineering, has scored positive results in a series of tests on the use of bio-chemical agents in different settings at home and abroad.

Prof. Chua said, "This method is built on the mechanism of biologically degrading the organic pollutants and inhibiting the proliferation of pathogenic bacteria. The composition of the agent is environmental-friendly and harmless to human health."

According to the assessment results of Prof. Chua's study conducted in the refuse chutes of selected residential buildings in Singapore, the application of his bio-chemical agent could effectively reduce the odour emitted from garbage by 75 per cent from 2,896 units (in ou/m3) to 724 units within five days.

Another assessment on the grease interceptor at a commercial building in Central showed that the bio-chemical agent has inhibited the growth of bacteria by 53 per cent from 680 to 320 units (in CFU/m3) within one month; the total volume of organic compounds also dropped by 15 per cent from 81.58 to 68.98 ppm.

The field data generated from a centre for the elderly in Tsuen Wan also proved to be very encouraging: the bio-chemical agent could control the growth of bacteria by 73 per cent from 220 to 60 units (in CFU/m3) in less than three months; and the total volume of organic compounds was cut by 29 per cent from 4.45 to 3.15 ppm.

"The agent is made up a novel blend of beneficial microbial consortium of a number of genera. These beneficial micro-organisms include those that may be familiar to the general public, namely lactobacillus, yeast, actinomycetes and photosynthetic autotrophic rhodopseudomonas," Prof. Chua said.

The agent can be applied directly to confined areas such as garbage rooms and animal farms by using an automatic and programmable nozzle system to create an ultra-fine and non-wetting mist. Alternatively, it can be introduced into the treatment area via the central air-conditioning system of premises.

This novel blend of micro-organisms has been assessed for toxicity in accordance with the American Standard Test Methods, and was proved to be safe to human health and the environment.

Prof. Chua introduces the bio-chemical agents at press briefing.