



# Degree Projects &

# Industrial Placements

2008





Designed, edited and produced in the Department of Applied Physics  
and Instrumentation by Denis Polley

## Foreword

Welcome to the 2008 edition of the CIT Department of Applied Physics and Instrumentation Graduates' Yearbook. It contains synopses of the project work undertaken by the students in the final year of our two honours degree courses:

- BSc (Honours) in Applied Physics and Instrumentation
- BSc (Honours) in Computerised Instrument Systems

A new inclusion this year is a preview of the annual industrial work placement undertaken by the third year students.

The students also write brief personal summaries about their academic backgrounds and interests.

As in previous years the project topics cover a wide range of specialisations .....  
DeltaV Software Systems, Robotics, Piezoelectric sensors, GPS, Process Control, Image processing and Environmental monitoring.

It is enriching to have the continuing pattern of industrial involvement in Final year projects and I wish to thank *Zenith Technology*, *ProsCon*, *GSK*, *Tyndall National Institute* and *Blackrock Castle* for their participation.

The Yearbook provides a vignette of the capabilities of our graduates and the wide range of project activities and staff interests within this department.

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*Head of Department*  
*May 2008*  
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## Automation of an assembly process using PLC's

Mark Barrett

Supervised by *Mr. Harvey Makin*



### Personal Details

Having successfully obtained a BSc (Ordinary) in Applied Physic. & Instrumentation in 2007, I took the opportunity to further my studies by pursuing a BSc (Hons) in Applied Physic. & Instrumentation opting to take the Instrumentation stream. My time at CIT has been complemented by six months work experience at ONG Automation in little island in cork where I was shown the particular relevance that the course has to real world industry.

Outside of college I work in a cinema and enjoy watching movies. I relax by going to the gym and listening to music and enjoy long walks on the beach.

### Project Summary

Assembly process are abundant in industry and also the automation of such processes with the use of robotics. By increasing the use of robotics in manufacturing and reducing human involvement companies can produce a better standard of product at a much faster rate and at a fraction of the cost. The goal of this project was to automate a Bytronic training rig with the use of a Siemens PLC and WinCC SCADA. Essentially when the project was completed all it required was that the parts be loaded to the training rig and it could handle the entire sorting and assembly process itself. Also as a part of the SCADA graphics were developed to give the user a real time display of what was actually happening in the process along with gathering information about any waste being produced. The process was interfaced via a sub net, which allows it to be controlled at great distance, making the real time graphics very beneficial to an operator who may not be able to see the process.



## PDA based Air quality measurement system

Mark Coleman

Supervised by *Mr. Richard Peard*



### Personal Details

I am currently completing my Honours degree in Computerised Instrument Systems, from which I will graduate in June 2008. I spent my 6 month third year placement at Novartis Pharmaceuticals in Ringaskiddy, Cork, and this afforded me great hands on experience.

My interests include Hurling, Golf, Hiking, Travelling, Go Karting and Classic Cars.

### Project Summary

My Project involved the development of an Air Quality Measurement System which operates on a PDA. This involved connecting Air Quality sensors to the PDA through an A/D Converter, and also connecting a GPS Receiver to the PDA - to give an exact location for where the readings are taken. A program was created to read all this data, and then log it accordingly to a file on the PDA.

Another program was created to copy this file from the PDA and to create another file which opens in Google Earth. This second file shows a pin on the map where each reading was taken, and along with this pin a message box displaying the Air Quality Index is shown. The colour of each pin reflects the Air Quality at that given location.



## Upgrade implementation verification tool

Finbarr Collins

Supervised by *Mr. F. O'Suilleabhain*  
*[ProsCon]*  
*Mr. Harvey Makin*



### Personal Details

During my studies in Computerised Instrument Systems, I have developed a vast range of skills in areas such as software programming, electronics, and automation. The course has enabled me to investigate specific industrial applications, and provided me with a solid career future. I completed my third year work placement at ProsCon in Carrigtwohill, having spent the majority of the 6 months based on site in GSK. The placement gave me the opportunity to see my course studies in an industrial environment, and provided a good platform to start 4th year.

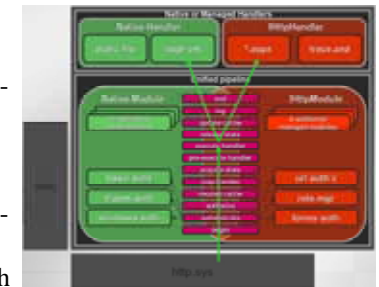
My academic interests include Automation, Control, Programming, and Design. In my spare time I like to play and listen to music, go to gigs, travelling, and socialising.

### Project Summary

I did my project for the Process Control department of ProsCon. As the Automation Industry uses technology that is continually advancing towards newer and better methods of control, the control systems require regular software upgrades and periodic hardware platform replacements. My project was to develop a tool for comparing the performance of a control system before and after the system upgrade thereby reducing project risk, allowing comprehensive testing, and minimising production down-time.

I did this using OPC, a method of enabling communication between software and automation hardware.

My Visual Basic.net application monitors each platform simultaneously, and verifies that process actions and sequencing are concurrent. Any discrepancies found between the two will be highlighted and logged.



## DeltaV automation of a Bytronic Process control rig

Kevin Croarkin

Supervised by *Mr. Denis Polley*



### Personal Details

I began my studies in CIT studying Electronic Engineering where I obtained an Ordinary Degree in 2005 and after a year out from studying I decided to pursue an Honours Degree in Applied Physics and Instrumentation. One of the main reasons for this choice was the lack of jobs in the electronics industry and I had also heard about the many job opportunities that were available to graduates from Applied Physics and Instrumentation. I spend my work placement with the Pfizer Ringaskiddy API Maintenance Department at the end of last year, where I gained six months of valuable experience.

My hobbies revolve around computers and my interests are mostly sports including soccer, boxing, MMA and I also enjoy watching films and reading novels in front of an open-fire....

### Project Summary

Automation is becoming more and more widespread in all areas of manufacturing. This project required individual element of the Rig (indicators, pump, heater, temperature sensors, etc.) to be connected to DeltaV I/O Modules as well as providing the required signal conditioning needed for DeltaV to communicate with the Rig.

The elements of the Rig that were linked had to be interlocked using DeltaV, for example; the pump must stop running when the process tank becomes full. A user interface was created where the user could choose whether to control the rig manually or to choose the option of automated control. This automated control asks the user to enter (for example) a temperature and the DeltaV system then uses PID control to bring the Process Tank to the desired temperature. The user interface also allows the user to specify values for P, I and D. A real-time graph is provided within the user-interface.



## Avalanche photodiodes for high speed imaging

Tom Daly

Supervised by *Dr. Josh Reynolds*



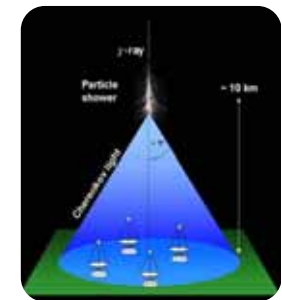
### Personal Details

I worked for twelve years in the pharmaceutical and chemical industry. I began studying in the Electronics department in 2003 and obtained an BEng(Ordinary) in Electronic Automation and Robotics in 2006. I then decided to transfer to the Physics department and enrolled for a BSc in Applied Physics and Instrumentation. I enjoyed the course and my time in the Applied Physics department and therefore decided to carry on to the Instrumentation stream of the BSc(Hons) in Applied Physics and Instrumentation.

### Project Summary

My project involved the investigation of avalanche photodiodes in imaging. Sensl is a company that specializes in the development and manufacture of low light sensing solid state devices and they have a research and development facility in Blackrock. Using sensors developed by Sensl, I have been endeavoring to detect Cherenkov air showers that occur when cosmic and gamma rays enter the Earth's atmosphere from outer space.

The project also involved taking a data acquisition system designed for use with traditional photomultiplier and attempting to use it to acquire data from Sensl's solid state devices.



## PC enabled communications with multiplexed I-squared-C devices

Paul Farragher

Supervised by *Dr. Anthony Grant*



### Personal Details

My time in C.I.T. began in the electronics department where I spent three years. However at the end of my three years in electronics there was a lot of uncertainty there was a lot of uncertainty in the electronics area at the time. This was one of the main reasons I decided to make the change to Computerised Instrument Systems. This wide ranging degree course gives experience with a wide rang of industrial tools and solutions.

I also completed my work experience at Insteco Ltd in Carrigtwohill, Co Cork. Here I had experience working on a wide variety of instruments carrying out calibrations, reprogramming of sensors and also Certification of devices. My personal interests include rugby, GAA, Pitch and Putt and soccer. I also enjoy listening to music and watching films and I enjoy socialising.

### Project Summary

I-squared-C data buses were invented during the 80's as a way to link IC's such as in a computer or T.V. linking up the microprocessors to the data registers etc.

I-squared-C bus stands for Inter-IC bus.

The aim of my project is to use the I-squared-C available on one device and use it to control another device using I-squared-C. The First Touch device that I used was capable of measuring a number of parameters including, light sensor, temperature sensor, capacitive touch sensor and proximity sensor.

The outputs from these devices would then be communicated using I-squared-C.

Then another circuit was used to control this board using I-squared-C protocols which were connected via USB. This is a very useful way of remotely controlling devices using I-squared-C. This application can be used in industry for controlling devices such as sensors and remote devices etc.



## PDA enabled communications & control of a data capture board

Nelius Foley

Supervised by *Dr. Catherine Frehill*



### Personal Details

Having successfully completed an Ordinary degree in Applied Physics and Instrumentation in 2007, I pursued my education by studying for an Honours Degree in Applied Physics and Instrumentation. During my Ordinary Degree I also had a six months work placement with Novartis in Ringaskiddy, Co. Cork. This proved very beneficial and allowed me to gain valuable experience in an automation department as well as on-site experience on a large pharmaceutical plant. After completion of my Honours degree I hope to pursue a career in Automation.

My hobbies include playing GAA and soccer, watching films and listening to music.

### Project Summary

The aim of this project was to design and develop a generic software platform which will allow communication between a personal digital assistant (PDA) and data capturing evaluation boards. All the measurement data will be sent and received using the host USB port of the PDA and the Inter Integrated Circuit (I2C) bus, so an in-depth knowledge of the data transfer process and the protocols used was required.

The I-squared-C bus was introduced by Phillips in the 1980s. It is a standardised two wire bus interface between integrated circuits (IC) and is used in application specific IC's and in mass produced consumer electronics. It is now considered the de-facto standard in an extensive range of application fields. This project involves designing and developing a GUI using Visual Basic .NET software which will communicate from the PDA via a host USB port through the USB-I-squared-C module to an Analog Devices external data capturing evaluation board. The software developed will allow communication between the PDA and the evaluation board and control of all the measurement possibilities of the evaluation board from the PDA.



## Non-contact temperature measurement via Infrared cameras

Alistair Geary

Supervised by *Mr. Don Brady [GSK]*  
*Mr. Harvey Makin*



### Personal Details

I completed my ordinary degree in Electronic Engineering in 2006; I chose the Electronic Automation and Robotics option. I am interested in automation and robotics and so I elected to transfer to the ordinary degree in Applied Physics and Instrumentation as it seemed more related to this field. I completed the ordinary degree last year, carrying out my placement at GlaxoSmithKline in Curribinny. I worked with the automation group, where I learned a great deal about automation, IT systems and DeltaV. In my free time I enjoy video games, music, swimming and tinkering with computers

### Project Summary

The objective of the project is to create a temperature process that uses an infrared camera as the main sensor, and is controlled by DeltaV. Thermal cameras are used in industry for detecting faulty equipment and loose connections that generate excessive heat or “hot spots”. It can accurately measure the surface temperature of an object from a distance. The camera measures the temperature of a mixing tank filled with water from both a hot and cold tank. DeltaV maintains a temperature in the tank by changing the flow of hot and cold water with solenoid valves. Visual Basic Software with OPC features was developed for communicating process values from the camera to DeltaV via an RS-232 link. Control of camera functions such as zoom is also possible via this link. Other goals include: Comparing the accuracy of the camera with a standard industrial temperature sensor, analysing temperature from the video signal using National Instruments vision software and creating a DeltaV graphic with an imbedded Video preview of the camera. The main programming languages used are VB 6 and DeltaV's Function Block Diagrams. The main themes of the project are programming, process control and image acquisition.



## Computer managed class records

Rory Goggin

Supervised by *Mr. Ger Croke*



### Personal Details

After studying Mechanical Engineering for a year I decided to pursue a more computer orientated degree. Having studied Computerised Instrument Systems for the past 4 years I have gained a wealth of knowledge in computer software especially in the area of control and automation. While working at Core International during my 3rd year placement I developed a keen interest in web applications and the endless possibilities offered by using the web as a platform. My responsibilities at Core were to aid in the development of an application which would allow administrators to edit an employee self-service page; I learned several new programming languages during this period which included HTML, Javascript and PL/SQL. I also became familiar with Oracle Database Management Systems. This experience has proven highly valuable in the completion of my final year project.

### Project Summary

As biometrics is playing an increasing role in our society its benefits in securely and safely identifying people are very clear. This project involved developing an application which would log student attendance through the use of a biometric sensor. I used HTML and javascript in order to code the user interface, PL/SQL in order to store the attendance records to an Oracle 9i database and a Secugen Hamster III in order to acquire the fingerprints of each individual students.



## Portable medical device

John Keating

Supervised by *Dr. Catherine Frehill*



### Personal Details

Having Successfully completed the Ordinary Degree in Applied Physics & Instrumentation in 2006 I took the opportunity to further my studies and pursue an Honours degree in applied physics and instrumentation. I found my time at CIT to be very rewarding as the course combines both practical and theoretical facets of the subjects very well. During my time here I've been involved in many different projects such as program design, instrumentation & calibration and worked with new industrial control methods such as Delta V. My hobbies include traveling, sport and music.

### Project Summary

My final year project is to design a software interface to interact with and transmit data acquired, using Vernier medical sensors, to a PDA. Such a program would enable users to take medical readings, such as an EKG, of themselves use the software to identify areas of medical concern and transmit the results remotely to a medical practitioner for analysis reducing the need for outpatient care.

My project involved designing and programming the system using LabView, some medical research as well as transmission data over a Wi-Fi LAN.



## A study of final control elements in Safety Instrumented systems

Brian Kennedy

Supervised by *Mr. Harvey Makin*



### Personal Details

I originally completed the National Diploma in Science - Instrument Physics (Ordinary degree now) in 1988. I also completed the City and Guilds Industrial Measurement and Control Technicians Certificate - Part 1 and Part 2 at the same time. Since then I have worked in many roles, mainly technical and with a focus on valve automation. In 1999 I completed a Diploma in "Applied Project Management" run by the Institute of Project Management of Ireland in association with UCC and successfully completed the PMI USA Project Management Professional examination. My main interests include politics and sports.

### Project Summary

As a result of a number of major accidents in process plants around the world, resulting in multiple loss of life and costing millions of Euro in damages, IEC 61508 and IEC 61511 have been introduced by European Safety Standards Authorities to increase the safe operation of process plants. They require performing rigorous hazard and risk analysis, identifying safety functions, determination of suitable Safety Integrity Levels (SIL) and delivering safety via Safety Instrumented Systems (SIS). The objectives of the dissertation are familiarisation with the requirements of both standards, final control element compliance with IEC 61511, SIL calculation methods, final control element SIL certification (or verification) and third party certification issues.

The dissertation objectives were achieved using a combination of methods. These include literature review, two research questionnaires and a mini test case. The dissertation will give the reader a grounding on the basics of the standards. It demonstrates the important role of final control elements in Safety Instrumented Systems and the importance of using certified products giving verifiable reliability and delivering increased safety. It will also show that the IEC 61508 and IEC 61511 standards are not widely used or understood in Ireland, and highlight the surprisingly high use of layers of protection analysis.



## Flow rig adaptation & automation using DeltaV

Brendan Keohane

Supervised by *Mr. Conor O'Farrell*



### Personal Details

After successfully completing an Ordinary Degree in Applied Physics and Instrumentation, I took the opportunity to further my studies and pursue an Honours Degree while still in the college frame of mind. I opted for the instrumentation stream for this final year as this is the area I see myself pursuing for a career. As part of the Ordinary Degree I undertook a six month placement at Zenith Technologies in 2007. I found this experience to be very beneficial as not only did I gain experience in the Automation sector but I also got the opportunity to travel to Scotland to the GSK Montrose site for a two week period. Outside of college I enjoy anything car related, socialising, movies, fine food and a good sleep.

### Project Summary

The primary objective of this project was the construction of a flow rig equipped with Endress and Hauser Smart Instruments and the automation of the rig using DeltaV. The first task involved the construction of a frame to house the Instruments while also being completely detachable from the tank on which the flow was being monitored. The rig had to be detachable as the tank being use for the project is also being needed in the Department for various other labs. Instruments were connected to the process and also wired to the DeltaV modules via HART protocol.

The second stage of the project involved the automation of the process using DeltaV. Various parameters were read in from the instruments and appropriate formulas applied in DeltaV to obtain the flowrates. Screens were set up where the user could monitor the flowrates being measured from various instruments and also allowed the user to change the units of the measured variables.

The final aspect of my project involved creating screen animations.



## Automated reading of a Radon sensor

Ciara Leong

Supervised by *Mr. Ger Croke*

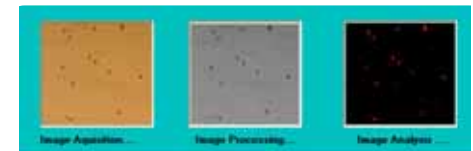


### Personal Details

Having obtained an Ordinary Degree in Applied Physics and Instrumentation in 2007, I choose to continue studying for an Honours Degree focusing on the Instrumentation stream of subjects. As part of the requirements for 3rd year, I worked as an undergraduate automation engineer in Eli Lilly in Kinsale for 6 months. My duties included tasks for validation, an inventory project for the Fieldbus network throughout the plant and configuring a prototype HMI for a new production line. When not studying I enjoy anything to do with music, giving relationship advice to the lads and dinosaurs.

### Project Summary

My project involved automating the movement, image processing and image analysis associated with radon sensors. Radon is a naturally occurring, radioactive gas that can build up to dangerous levels in buildings. To measure radon a passive sensor made from a type of plastic called Cr-39 is placed in a building and left for several months. Radon gas decays by alpha particles emission and when these particles encounter the sensor they cause damage to the sensor. The sensor is then chemically etched to allow these tracks to be viewed under a microscope. I needed to build a rig that would hold the sensor under a microscope, automatically moving it to allow 12 1mm square images to be taken, automatically detecting good focus, developing software that would count the tracks and converting this count into a measure of radioactivity.



## Automation of a process using DeltaV Batch

Tony Lyons

Supervised by *Mr. Tom Skeehan [GSK]*  
*Mr. Harvey Makin*



### Personal Details

In 2004, I began the applied physics and instrumentation course. I chose this course because I have always had an interest in engineering and had an interest in physics and mathematics before college. A major factor that made me chose this course was the demand for graduates in the pharmaceutical industry, which is prominent in Cork. As part of my ordinary degree year, I was placed in *Pfizer* Ringaskiddy where I worked in the engineering department. There, I was involved in a number of projects, mainly in OSP4 (Organic Synthesis Plant 4). Theses projects covered many areas which included E&I (Electrical & Instrumentation) design and installations and process control which I was prepared for having dealt with these areas throughout the duration of the AP&I course. Having completed my ordinary degree in 2007, I went on to pursue the honours degree as I felt there was a requirement for this level of education for graduates leaving college. I am very interested in pursuing a career in project engineering as I feel it incorporates every aspect covered in the AP&I course.

### Project Summary

A batch process was simulated using DeltaV. A Batch Process produces a finite quantity of free flowing product, usually a liquid or powder. A production plant was simulated using a *GEFanuc* PLC. PLC ladder logic was written to simulate all the instrumentation and equipment as defined in the process P&IDs. A serial link was then setup between the PLC and a DeltaV controller. Various modules and graphics were created in DeltaV, including a head tank, two reactor vessels, a filter dryer, heating skids and solvent manifolds. The simulated process carries out the various steps from start to finish, transferring product from a head tank into reactor vessels where chemical reactions take place and finally into a filter/dryer vessel where the products enters in a slurry form, gets filtered and dried to a fine powder. The system can be operated in manual mode but once the batch is running ,it sets to cascade mode where the operator is locked out.



## Avalanche photodiode characterisation

Enrique Moreno-Perez

Supervised by *Dr. G. Huyet*



### Personal Details

I was born in Granada, a city warmed by winds blown from the south of Spain. Maybe you have already realized that I am an exchange student from Spain. I studied physics in the “Facultad de Ciencias” at the University of Granada. I have been very lucky, as I have got an Honours Degree in Applied Physics and Instrumentation in Ireland. Of course! This has been a great year for me. Here, I have continued to learn about science, and other important things about the culture of Ireland. After my experiences in this country I believe really that I have grown as a person. In my free time I like to run. Also, I like to travel. This year I have travelled a lot. My favourite film is *Baran* (Rain). My favourite book is *Le Petit Prince* (The Little Prince) and I really like flamenco music.

### Project Summary

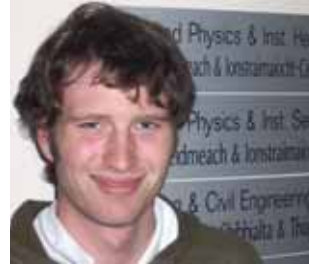
The avalanche photodiodes (APDs) allow detection of single photons. APDs operate at room temperature and have a long operating lifetime. The silicon photomultiplier combines the high gain of PMTs with the form factor, low voltage (~30V) and mechanical robustness of silicon APDs. This novel concept is also revolutionising the sensor technology used in all radiation detection and scintillator based sensing applications.. The characterization consists of measuring obtaining the most important parameters from APDs detectors. SensL, a Cork based company, has developed Silicon Photomultiplier (PMTs). The Silicon Photomultiplier (SPM) technique connects arrays of SensL's core CMOS compatible photon counting (Geiger mode) photodiodes together in parallel, each with an integrated quench circuit on a single piece of silicon. An incident photon on any photodiode produces a pulse of current at the sensor output. The total output is the sum of all the individual pulses of current which is proportional to the number of photodiodes detecting a photon at any moment in time, which in turn is proportional to the incident photon flux.



## Resonant inspection for liquid level measurement & crack detection

Donal O'Donovan

Supervised by *Mr. Richard Peard*



### Personal Details

Having successfully obtained a BSc in Applied Physics and Instrumentation in 2007, I took the opportunity to further my studies by pursuing the BSc Honours in Applied Physics and Instrumentation. My studies were complemented by having six months work experience in Carbery Products whose headquarters are based in Cork, Ireland, where many of the elements in the course could be seen in practice. My hobbies include Greyhounds, GAA, Pitch and Putt, Soccer, Music and Rugby "Irish by birth Munster by the grace of God".

### Project Summary

My project involved developing an automated, PC based system, using the technique of **resonant inspection**, to measure the level of liquid in a vessel, and to detect cracks in objects.

It involved designing an impact system which would strike a glass and cause it to resonate. The waves produced by the impact would then be analysed within a LabView program to indicate the actual volume at any point of the filling process. It was also observed that the resonance (ringing) of the glass was seriously reduced with the presence of cracks on the glass surface.



## Automation of Control valve calibration using DeltaV

Eoin O'Leary

Supervised by *Mr. Denis Polley*



### Personal Details

Having completed the Ordinary Degree in Applied Physics & Instrumentation in 2007 I took the opportunity to further my studied in this area and carry on with the Honours Degree in Applied Physics & Instrumentation. I originally pursued in doing this course because of my interest in this area and found the instrumentation/engineering side of great reward. I spent 6 months on placement with Pfizer Loughbeg API in 2007 and this concreted my interest in the industrial world and the job opportunities available to me through completing this course. I enjoy most sports but especially soccer, hurling, golf and boxing and my other interests include music, relaxing, fine food and crazy dancing.

### Project Summary

Control valves represent 90% of the final control elements used in process control and automation. The characterisation and calibration of such devices is of paramount importance in providing high quality product. The project uses the commercial automation package, DeltaV which provides the control and data gathering from the process. In order to automate the valve and process a digital Fieldbus stem positioner had to be mounted on the control valve. The DeltaV I/O also had to be interfaced with the process and a Foundation Fieldbus protocol communication was set up from the controller to and from the process. The core of the automation strategy took place in the control studio module in DeltaV where a SFC (sequential function chart) was used to control the filling and emptying of a 24.5 litre tank. An interactive graphic of the process was then created. The automation was designed so that the relevant values from the process could be sent out to Microsoft Excel and a macro then enabled an automated generation of a characteristic curve. The plotted axes consist of stem position (%) against flowrate (l/min). The curve highlights any "stiction" or fault in the valve.



## Non destructive investigation of surface coating using XRF

David O'Meara

Supervised by *Mr. Ger Croke*



### Personal Details

Having successfully obtained an ordinary Degree in Applied Physics & Instrumentation in June 2006 I decided to take a year out to travel around Asia and Australia. On my return I continued my education by pursuing an Honours Degree in Applied Physics and Instrumentation. Under new flexible course arrangements, I chose a variety of subjects from both the instrumentation and the physics side. I also managed to gain work experience in Pfizer pharmaceuticals, Loughbeg, allowing me to apply the skills I had learned in the previous three years of study as well as learning many more.

My personal interests are soccer, health & fitness, reading, listening to music, pool/snooker, darts and weightlifting.

### Project Summary

The technique of using x-ray fluorescence is well known. Throughout this project I used x-ray fluorescence (XRF) to carry out multiple experiments. The first was to quantitatively examine a number of known samples ranging from titanium to gold as well as a number of unknown samples. Another aspect of x-ray fluorescence that I investigated was how x-ray energies vary with the atomic number of the elements. The main application of x-ray fluorescence that I examined was their use as a non-destructive means of determining the thickness of a coating. This involved electroplating iron coatings onto copper substrates and then examining the electroplated sample with XRF. Using an AMPTECH XR-100CR Si detector and Maestro software I examined the x-ray spectra of the iron coated copper and using Rigel software and some calculations I was able to determine the coating thickness. I also electroplated iron coatings onto other materials such as graphite and aluminium foils and examined those spectra. To confirm the accuracy of the thickness measurements I used a coordinate measurement machine (CMM), which optically measures the step change in the topography of a sample.



## Document Control system

Darragh O'Riordan

Supervised by *Mr. Will Lehane [Zenith],  
Dr. Catherine Frehill*



### Personal Details

I completed a Higher Certificate in Electronic Engineering at CIT in 2004. I found that I enjoyed working with software more than hardware and decided to pursue a degree in Computerised Instrumentation Systems instead of continuing with Electronics. I have really enjoyed my time in the Physics Department and studying for the degree has really helped me with by combining practical experience with a broad syllabus. In 2007 I completed a 6 month work placement with Zenith Technologies as part of the degree programme.

### Project Summary

For my Final year project I have developed a .NET framework, database driven replacement for a software tracking system. This information would have been previously stored as an Excel file. A document management system is required to provide accurate reporting, accounting and tracking of all documents relating to a project. The MES system will used for validation resource tracking and document control for engineering projects at Zenith. It is a multi-user system which is designed to improve communication and collaboration on various aspects of the overall status of a project.



## Install & calibrate a telescope in a robotic observatory

Eoin O'Riordan

Supervised by *Ms. Eva Norris*



### Personal Details

Having completed the BSc (Ordinary) in Applied Physics and Instrumentation in 2007 I decided to pursue the Honours Degree as this would provide better employment and career opportunities. During my time in CIT I have also gathered one year work experience with Hanley Calibration Services in Little Island as an Instrument technician. During my time at Hanley's I have worked in many sites around the country including Pfizers, Boston Scientific, Alza and Schering Plough. My duties included calibrations, loop testing and instrument maintenance. I have gained invaluable experience during my time with Hanley's working with all kinds of sensing and measurement Instrumentation.

My academic interests include physics, instrumentation and astrophysics. I also enjoy soccer, films, documentaries and socialising.

### Project Summary

Robotic observatories are capable of remote operation and can communicate with other networked observatories. The observatory collects weather information from weather station sensors and is capable of turning off the equipment and closing the dome should weather conditions become unsuitable for observations. Other safety features include closing the dome in the event of a loss of communication with the control program and preventing the wires connected to the telescope becoming wrapped around the telescope. My project involves the installation and calibration

of a small robotic facility. A robotic dome housing a Meade LX200GPS Telescope is installed on Blackrock Castle. The telescope will be polar aligned and its pointing accuracy determined experimentally. A graphical user interface to remotely control the operation of the dome and the telescope will also be implemented. The user will be able to enter coordinates and slew the telescope to the defined coordinates. The telescope and the dome shutter will be linked

to ensure that the telescope is always pointing out the open shutter.



## Characterisation of mechanical deformations of piezo bending structures

Mike Reid

Supervised by *Dr. Anthony Grant*



### Personal Details

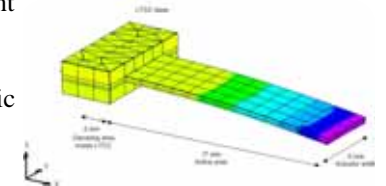
Began college studying Electronic Engineering and after the Ordinary Degree decided that I wanted a broader knowledge base. I prefer applications with electronics rather than analysing electronics so the Applied Physics and Instrumentation course was an ideal change of direction. Holding an Ordinary Degree in Applied Physics and Instrumentation at present which will hopefully be exchanged for an Honours Degree soon.

Hobbies and interests vary but I'm happy if I'm active and trying new things. Sports include soccer and cricket, when the weather is available water sports.

### Project Summary

Micro-electromechanical Systems (MEMS) have surged forward with micromachining and nano-technology. Micro beams within MEMS using piezoelectric materials have been used as cantilevers and bending beams in order to obtain a measurable variable. The concept of the project was to create a measurement system that would be able to detect the very small movements of such materials while under stress of resonant frequencies, to collect the data and to characterise the physical response of the material.

The measurement was achieved by using a laser beam in conjunction with a semiconductor Position Sensitive Detector. The output reading from the PSD and circuitry is a voltage representative of the movement of the structure under test. The output is graphed by a LABview function and displayed on a computer screen. The form change in the piezoelectric structure due to the piezoelectric effect has been captured and can be analysed.



## Weather monitoring system in a robotic observatory

Anna Veyrenc

Supervised by *Ms. Eva Norris*



### Personal Details

I am a French student and I am doing my Erasmus year in Cork Institute of Technology. As I am in a French school of engineering and I like the instrumentation, I decided to conduct a project in the Department of Applied physics and Instrumentation. I enjoyed working in Blackrock Castle, improving my English and my instrumentation and calibration skills along the way.

I hope to continue my study in France with a Master in Spatial techniques and astrophysics instrumentation.

### Project Summary

My project was based in Blackrock Castle Observatory. One of the important projects in the Observatory lab is to make the telescope robotic. It means that the telescope and the dome has to operate alone (“think alone”) without any human assistance. A weather monitoring system is a critical part of any automated robotic observatory. The rain, humidity or the wind can affect the telescope or the dome and lead to considerable damage. Moreover, even if the conditions are safe, a cloudy sky can prevent observing and it's not really useful to open the dome in this case. My project is to upgrade the existing weather station, to calibrate all the sensors involved and to link this station to the dome control software. I am also building a web page for the Blackrock Castle Observatory website where I will display all the information about the weather station in real time.



## Vision based 2-D tracking system

Padraig Walsh

Supervised by *Mr. Richard Peard*



### Personal Details

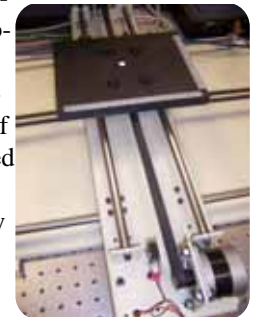
In 2003 I began studying Electronic Engineering here at CIT and after 3 years I successfully completed the Ordinary Degree. An option to transfer to the Applied Physics & Instrumentation was available which I considered the best strategy due to the uncertainty within the Electronics Industry. The hands on aspect of the subject also appealed to me. The API course offered a wide range of subjects which catered for many career opportunities.

As part of my undergraduate placement I spent 6 months at *Eli Lilly Kinsale* working in the maintenance department during which time I was worked on and completed a project developing new tolerances for critical instruments using the measurement uncertainty of those instruments and associated devices. During my placement I gained valuable on-site experience.

My hobbies and interests include football, cars, fishing and shooting and of course a couple of pints when the opportunity arises!

### Project Summary

The object of the project is to monitor the movements of a object using a stationary CCD camera. If the object moves an error signal is created and used to reposition the point back to its original location using a dual axis positioning table. This project required the development of LabVIEW software program to take an image from the CCD camera along with a stored reference image and use a technique called Cross Correlation to calculate an error value of how much the object had moved by. This error value is used to calculate by how much each stepper motor on the positioning table needs to move to reposition the object directly under the camera. A PXI computer was introduced which would solely run the cross correlation program and return the error value to the host PC which carried out the motion correction. The PXI system is accessed & configured through the network.





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*Year 3 Industrial*  
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*Placements*  
.....  
*2008*



## Endress & Hauser

John Ahern

Supervised by *Mr. Pat Howard*



### Personal Details

I joined the course in September '05 with the intention of taking my education to a much higher level and am currently completing my third year work placement with Endress & Hauser Ireland. My work on placement has consisted of many interesting and challenging tasks one of which is discussed in brief below. My interests include music and sports.

### Placement Overview

One of the many tasks given to us while working with Endress & Hauser was to set up a demo device to measure the level in a tank for training and demonstration purposes. The task itself involved some interesting challenges including linearising the meter to read correctly. This may seem like a trivial task however as in many cases in the real world the tank had a dome shaped bottom and the meter was to read in kilograms. After correctly setting up the meter the 4-20mA output was also set up and an alarm condition was programmed into the meter which would go off in the event of the tank overflowing.

## Pfizer

Richard Baitson

Supervised by *Mr. Jim Fleming*



### Personal Details

I chose to study Computerised Instrument Systems in CIT because I've always had an interest in computers and how things work. Being a part of the Physics and Instrumentation course appealed to me for those reasons, and the Computerised sections that came with it were very attractive to my interests. I had also seen, from the CIT open day, the many job opportunities that are possible with this broad field of study, both nationally and internationally. I gained valuable knowledge about instrumentation, control processes and procedures from a six month industrial placement with *Pfizer Pharmaceuticals Loughbeg Drug Product Plant*.

My hobbies and interests include soccer, music and films.

### Placement Overview

The placement consisted of a six month period in the instrument calibration industry. Calibration involves ensuring that all instruments are working in accordance to certain tolerances and procedures within a given process. In the case of my placement this process was the manufacture of the cholesterol reducing tablet *Lipitor™*. My position with this company, during the placement, was as a calibration technician. The tasks I was given were never monotonous and were always rewarding.

Instruments I calibrated and tested include; Current to pressure converters, micromotion and ultrasonic mass flow meters, temperature, humidity and emissivity sensors and probes, pressure switches, agitators, bulk weighing scales which can handle up to 2000 kg and a large number of other instruments, which are not only used in the plant in which I was placed, but throughout the pharmaceutical, manufacturing and food processing industries. With the placement I also received experience with an automated computer control system known as Satchwell™ Building management systems.

Novartis

Stephen Barry

Supervised by *Mr. Kevin Creedon*



### Personal Details

I began my time at CIT as a 1st year student in Applied Physics and Instrumentation in 2005 and obtained the Higher Certificate in 2007. I am currently working towards obtaining the Ordinary Degree this year and hopefully progressing to the Honours Degree next year. I became interested in the course because my older brother works as an instrumentation technician. His advice steered me towards this course. Outside of the course my interests vary from music, where I like to play the guitar and have successfully built two electric guitars in past projects, to sport, where I enjoy watching hurling and Formula 1.

### Placement Overview

My 3rd year industrial placement was completed with Novartis Ringaskiddy Ltd. While on placement I was involved in various tasks and projects including the implementation of Portable Appliance Testing for the first time at Novartis, the validation of calibration software which calculates recommended calibration frequencies and percentage drift over time, the investigation of a project to introduce a new automated calibration system on site which could drastically reduce calibration time and paperwork. I was also involved in the checking and approval of various CAD drawings of different site details such as hazardous area classification and barrier wiring systems. This placement has been hugely beneficial to me and has introduced me to the realities and responsibilities of working in an industrial environment.

Eli Lilly

Glenn Buckley

Supervised by *Mr. Jim Nolan*



### Personal Details

Having completed the Higher Certificate in Applied Physics & Instrumentation in 2007 I took the opportunity to further my education by enrolling in the Bachelor's Degree course. I hope to complete the Bachelor's Degree in June 2008 and ultimately pursue the Honours Bachelor's Degree.. One of the main reasons why I opted for the course was the high demand for graduates in industry and the superb career opportunities available.

As part of my Degree programme I worked as an undergraduate maintenance engineer with *Eli Lilly* where I gained valuable experience and insight into the operations of a major pharmaceutical manufacturing facility. My academic interests include instrumentation, automation and electrical engineering. My personal hobbies are sports, including soccer and GAA, music and socialising.

### Placement Overview

In *Eli Lilly* I performed a number of tasks within the maintenance department. One of the main projects undertaken included estimating the uncertainties in measurement loops for critical process applications in various locations on site including a new biotechnology facility currently under construction. This is obtained by determining the uncertainty of each component in a measurement loop using mathematical techniques and calculating the net magnitude involving the entire loop. These values are compared with limits specified by quality engineering. Critical systems are those where inaccuracies in measurement have a direct bearing on the safety, identity, strength, purity, etc of the raw material or final drug product. I worked on Maximo, a Computerised Maintenance Management System which manages the assets within the Maintenance department of *Eli Lilly*. I investigated possible electrical fault situations regarding discrimination between circuit protection devices involving time/current tripping curves for various types of breakers. A number of other tasks on document validation were performed. Several training courses were also completed.

Fournier

Kealan Burke

Supervised by *Mr. Peter Shortland*



### Personal Details

In 2007 I obtained a Higher Certificate in Applied Physics and Instrumentation at CIT. During the two year course my interest in both physics and the Instrumentation industry grew greatly. On completion of the course in June 2007, I was offered a summer job as a maintenance technician in *Fournier Laboratories Ireland* where I furthered my knowledge of instrument calibration and repair. This summer work gave me an insight into what life in industry was like, and drove me to return to CIT to study for Bachelor of Science in Applied Physics and Instrumentation.

In the hours I have free I enjoy hill walking, sailing, and power boating.

### Placement Overview

This placement was conducted in *Fournier Laboratories Ireland* where I worked as an Instrument technician. *Fournier Laboratories Ireland*, as like most pharmaceutical companies, views instrument calibration with paramount importance.. During the placement I gained valuable experience calibrating everything from temperature transmitters to flow meters. I gained practical hands on experience using certified pressure calibrators, temperature baths, humidity salt caps, tachometers and anemometers to calibrate a wide variety of instruments. This practical on site experience expanded further on the lab work I had done in CIT. I also learned the importance of Good Manufacturing Practice (GMP) in the pharmaceutical industry, and rules for GMP compliance in everyday work, such as proper opening procedure before a GMP Production room. I gained valuable experience in the use of the *CompuCal CMMS* system which electronically manages and controls calibration certificates and the calibration history of every instrument on site. On completion of each calibration, the calibration certificate must be entered to the *CompuCal* system, and accepted before the instrument clears, and the next calibration is moved on to.

Eli Lilly

Gary Cummins

Supervised by *Mr. Gerard McCarry*



### Personal Details

I started Applied Physics and Instrumentation in CIT in 2005 and am currently on placement as part of the third year of the course. I chose this course as I had an interest in having a practical qualification and the course offered a very wide scope of education including a strong emphasis on practical subjects. The course also offered promising employment opportunities in an area that I have a great interest in. Past times include rowing, running and guitar

### Placement Overview

My placement was done in Eli Lilly, Kinsale. I worked in the process automation department under the supervision of technical lead Gerard McCarry. A new 400 million Euro biotechnology facility is currently being built in Kinsale and I worked a number of different elements in this project, most notably on the human machine interfaces that the operators will be using to control the process. I created a number of graphics that will be used in the final control system and also worked on the classification and configuration of the Thin Clients (which are essentially small PCs) which will be used to run these human machine interfaces. I gained valuable experience and knowledge of the distributed control system - Foxboro I/A and feel now that I have a good understanding of how automation and instrumentation is applied in industry. The placement here allowed me to see how a control system is operated and automated in a practical real life setting and the knowledge that I learned from the Applied Physics and Instrumentation in CIT was invaluable to my understanding and progress in the work that I did.

Tyndall

Simon Fabri

Supervised by *Ms. Fatima Gunning*



### Personal Details

I am French and I chose to come to the CIT for learn English and follow a normal study year. I came to Ireland to add a strong difference in my CV. Enrolling for an equivalent of a Higher Certificate in Applied Physics and Instrumentation, I continued in this way with the third year of the Applied Physics & Instrumentation course. This year brings me to a more general and applied knowledge base and the possibility to do a placement.

My major hobbies and interests are sporting, like rock-climbing and bouldering and also music, playing the guitar.

### Placement Overview

The optical fiber is today an essential way to improve communication. This technology brings a possibility of an exponential capacity of transmission, particularly in internet broadband. The densification of the canal of transmission implies however more powerful tools to control the quality of the data received. In the Tyndall National Institute, in the centre of Cork, research is undertaken to increase the possibility of transmission by optical fiber.

My project is about one of the tools used as control, the Optical Signal to Noise Ratio, know as OSNR. I was asked to find a better way to calculate this. Moreover, I automated this by programming with LabVIEW 8.0 of National Instrument.

ONG Automation

Padraig Greaney

Supervised by *Mr. William Fitzgerald*



### Personal Details

I began my college education in UCC where I studied Electrical Engineering for 3 years. After I finished I decided to further my education by studying Applied Physics and Instrumentation in CIT. I decided to do this course because I heard it was highly regarded in local industries and that there was always great job opportunities for graduates. There was a big difference in the two courses, the Electrical Engineering course had been largely based on theory whereas the Applied Physics course in CIT emphasizes on lab work preparing the students for the tasks ahead when they acquire a job. This suited me much better. I am a keen sportsman and a lot of my time is spent training and playing for numerous teams. I play soccer with CIT and hurling and football with Douglas GAA. When I get some free time I also like to surf and play golf.

### Placement Overview

This placement was conducted in ONG Automation in Little Island. I got involved in the documentation side of engineering from the start being assigned to an ONG job for Becton Dickinson and SkidTek. I learned a lot about the documentation side of a project and I also got the opportunity to write out test documents. I then got to see these tests being performed in industry. I have also used Autocad on a regular basis to apply changes to the electrical drawings of the Water and Transfer systems which this project is based on. I also applied minor changes to State Diagrams and Sequential Function Charts (SFC) which were involved in this project.

During my placement I also got the opportunity to go on a 3 day training course in Maynooth. The course was being held by Schneider Electrical who are one of ONG Automation's customers. The idea behind this was to further my education in SCADA systems. The training course was based on a SCADA system called Vijeo Citect Version 7.0 and it really developed my knowledge of SCADA and its importance in industry.

*Eli Lilly*

Gabriel Greene

Supervised by *Mr. Denis O'Mahony*



### Personal Details

I began studying Applied Physics and Instrumentation in 2005 and achieved a Higher Certificate with Distinction in the course in 2007. I went on to study for the BSc(Ord) in Applied Physics and Instrumentation in March 2008, currently awaiting examination results. My industrial placement commenced in March and extends until late August in the pharmaceutical company Eli Lilly's branch in Dunderrow Kinsale, in the Maintenance/Engineering department. Expecting to graduate in summer 2009 with an Honours Degree in Applied Physics and Instrumentation. Thoroughly enjoying the course. After working in Eli Lilly, it is plain to see how well the course prepares you for a scientific/industrial career.

### Placement Overview

During my time here I was placed in the daily maintenance operations team, and a thorough insight was thus achieved into how the chemical/pharmaceutical industry operates and deals with day to day tasks. I have learned how to deal with instrumentation vendors and suppliers, install process line laser alignment software, prepare spreadsheets that catalogue instrument and equipment locations, serial numbers, invoices, delivery dockets etc, Familiarity was also gained with electrical distribution line diagrams and a general appreciation of how a pharmaceutical production plant functions was achieved. Overall, valuable experience has been gained in the type of work I may be involved in when I graduate.

*Eli Lilly*

Patricia Heharty

Supervised by *Mr. Gabriel O'Dwyer*



### Personal Details

I chose to do Applied Physics and Instrumentation at CIT because I enjoyed physics at Leaving Cert level and was told that I would be more employable with the Applied Physics and Instrumentation Degree than I would coming out of other physics based courses in the country. However the most appealing part of the course was the fact that class time was split almost equally between theory and practical exercises. The skills that we learn in this course are extremely applicable to many industries, especially those in the Cork area. In my free time my hobbies include travelling, shopping and GAA.

### Placement Overview

I did my industrial placement in Eli Lilly S.A in Kinsale. Eli Lilly is a leading, innovation-driven corporation committed to developing first-in-class pharmaceutical products. Lilly are the creators and manufacturers of the worlds most famous antidepressant Prozac®. The placement, which was undertaken over a period of almost 12 weeks consisted of an extensive range of training courses to do with industrial and chemical safety and also on Lilly standard operating procedures. My main tasks once I was trained were based around testing and validation of computer systems and to improve the Distributed Control System inventory documenting system so as have a more comprehensive disaster recovery plan in place. Being exposed to this type of Industrial Environment has helped me choose what career path I want to take and what subject matter I wish to study for my Honours Degree.

Novartis

Peter Howard

Supervised by *Mr. Seamus McGrath*



### Personal Details

Initially having obtained an Honours Degree in Biochemistry from Trinity College Dublin in 2006 I found my job prospects were pigeon holed towards the quality control department of pharmaceutical manufacturing. While having a greater interest in the process control and development aspects of the industry I decided to steer my career in this direction using Applied Physics and Instrumentation as the vehicle. Having gained entry into the third year I believe this course will act to supplement my biochemical background. Currently I am employed with Novartis a pharmaceutical company based in the Ringaskiddy as part of the student placement.

My interests include swimming, cycling and running.

### Placement Overview

My activities as part of the automation department in Novartis Ringaskiddy included Graphic design using software packages which aid in the monitoring and control via display of the various production equipment and conditions. In addition these graphics are validated for discrepancies. This placement has provided me with a practical knowledge and understanding of the distributed control system used at Novartis and some of the activities undertaken by myself included maintenance of the hardware that is required for the effective operation of this system. Further roles conducted include updating a database which logs any temporary changes that occur to the specification requirements out in the field.

Tyndall

Neil Kelly

Supervised by *Mr. Stephen Hegarty*



### Personal Details

I am currently in my third year studying Applied Physics and Instrumentation at CIT This course appealed to me, since I have always had an interest in Physics, and its influence in industry seemed very interesting. Despite the economic uncertainty in Ireland today, job opportunities in the manufacturing industry still provide highly skilled positions. This was one of the reasons why I chose to return for my third year. This, with the addition of work placement in the academic year, was a rare opportunity.

Having received my Ordinary Degree last year, I have gained knowledge in a wide area of instrumentation this year. The likes of Visual Basic, Siemens Simatic and Delta V should stand me well for the future.

In my spare time, I enjoy reading, music and going to the gym.

### Placement Overview

The project was based at Tyndall National Institute in Cork City. They are renowned for their research and design in the area of optoelectronics. This was centralised around the photodiode, which is a key component in both the research, and manufacturing industries alike. The photodiode is an optical sensor, which can be used for light intensity measurement, quality control and in safety alarm systems. The goal was to design, build, and house a photodiode circuit which can be practically used in the laboratory. The circuit would include an Indium Gallium Arsenide (InGaAs) detector, which detects in the IR range under low powers.

Many parameters were investigated, including the two modes of operation - photovoltaic and photoconductive. The methods of measurement and biasing (supply) were also covered. One of the major inclusions was a low battery indicator circuit, which would inform the user when the supply needs to be changed. A digital LCD display, switches and a choice of sensing resistors became later expansions of the project.

## DPS Engineering

Alan Kennedy

Supervised by *Mr. Kevin Dignam*



### Personal Details

Having graduated with a Bachelor of Engineering of Electronic Engineering Degree in 2006, I worked full-time as an electronics debug technician for over a year before deciding to pursue a degree in Applied Physics & Instrumentation, due to the lack of job opportunities in the electronics sector. I quickly realised that there were excellent career prospects available in the instrumentation sector, both nationally and abroad. The subjects provided on the course were very applied which resulted in a smooth transition to industry placement. In my placement with DPS Engineering, Little Island where I gained valuable on-site experience with clients such as Schering-Plough and GSK. I gained an informative insight into many aspects of the Pharmaceutical sector.. I intend to work abroad on a graduate program for the forthcoming year before resuming my studies with the Honours Degree in Applied Physics & Instrumentation.

### Placement Overview

DPS Engineering were contracted to provide a DCS upgrade for the Interferon fermentation and extraction process as part of the Contingency Fermenter Process for Schering-Plough, Innishannon, Co. Cork. Interferons are natural proteins produced by the cells of the immune system of most vertebrates in response to challenges by foreign agents such as viruses, parasites and tumor cells. Interferons are being used by Schering-Plough to manufacture drugs to treat Hepatitis B and C and some cancers. My duties in this project included the compilation of instrument indexes and on-site assistance in a front-end study for conceptual design purposes. The completed automation system will provide the following: Batch control and basic control of equipment, Electronic recording of process and batch information, Logging, audit trailing, security, backup and data retention. All of the above will be obtained by utilising ABB standard library software modules and software modules that will be developed by DPS for Schering-Plough.

## Emerson

Elizabeth Martin

Supervised by *Mr. Dave Mullins*



### Personal Details

I choose Computerised Instrument Systems because I enjoyed physics and maths at school. I have always enjoyed problem solving. The emphasis on the design, development and implementation of computer controlled instrument systems, with particular attention given to interfacing techniques and networking really interested me.

### Placement Overview

I am in the middle of my six month placement at Emerson Process Management, in Cork Airport Business park. Here I am working on equipment modules and helping with the graphical interface. I am also doing a training course in Compliance Suite, which will allow plant operators to store all calibration and operation details. It also supports the tracking of all incoming and outgoing goods. This training is giving me an excellent idea of what working in process environment.

## Blackrock Castle

Maria Martin-Robles

Supervised by *Dr. Niall Smith*



### Personal Details

As normally happens in the Erasmus exchange program, the degree at your home university is not always exactly the same as the one in the host university. In my case my degree in Spain is more about theory of physics which is something exciting and interesting but some practice is always needed, and here is where CIT plays a role. A lot of things are tested in the lab, and we also went through some of the main computer programs we need to test all this. So this year apart from improving my English has been a great opportunity to learn new things and different.

### Placement Overview

In Blackrock Castle Observatory in Cork, a group of researchers are looking at the sky with the aim of find extra solar planets. But this search is difficult because the sky is so big, and plenty of places to look at. It will be useful if we can find any part of the sky which is more likely to have extra solar planets. And this is what my project is about. To find extra solar planets there are so many techniques, but the one I'm using is called: *Transit Technique*. In this method as a planet passes in front of a star, an observer will see a black spot travel across the star. During this transit, the planet will block an amount of light coming from the star, causing the observed brightness of the star to decrease.

So the problem has to be reduced in an optimisation matter, which means we have to know all the parameters involved. Once we know this parameters we need to know how important is each parameter and how much it affects the problem.

## Endress & Hauser

Michael McCarthy

Supervised by *Mr. Pat Howard*



### Personal Details

I began studying for a higher Certificate in Applied Physics in September of 2004 after completing my Leaving Certificate. I chose this course to continue my studies in applied physics and because I heard that there are great employment opportunities. I took a year out in 2004 to go travelling and came back in 2007 to finish the course and get an Honours Degree which I felt would help me secure a job in the pharmaceutical industry. My hobbies and interest include listening to and writing music, reading and film.

### Placement Overview

The placement is separated into two headings: **Helping and Learning**. The basic ideal behind this is that for all the knowledge and experience given to me by Endress & Hauser, they get assistance in the everyday and ongoing activities of the company. The Learning segment is broken down into two parallel modules: **Overview and Hands - On Training**. The purpose of this is to give me full in depth understanding of the theory and practical elements of E+H equipment. The overview consists of a presentation given by a member of the sales team while the Hands-On session is meant to show myself how to configure, operate, calibrate, use diagnostics, and occasionally repair a device and is conducted by a member of the service team. The helping aspect is meant to allow me to gain experience of all areas of the company and help contribute to the overall running of the company. This allows me to gain familiarity with departments that I would not get within the confines of college such as marketing, administration, documentation and store room activities.

## Veolia Water Ireland

John Murphy

Supervised by *Mr. Vincent Shanahan*



### Personal Details

I am currently in my third year of the Applied Physics and instrumentation course at CIT. I chose the course as I had an interest in physics and wanted a career in the area of instrumentation. I had received good feedback from people working in this area and there appeared to be significant opportunities available for graduates of the course in Ireland and abroad. As part of the AP&I course I am currently carrying out a 3 month work placement with Veolia Water Ireland. In my spare time I enjoy the outdoors, playing music, and have an interest in science.

### Placement Overview

I am placed with Veolia water Ireland Co.Kilkenny. The company produces design build and operate solutions for water and waste water treatment plants across the country. I am stationed in the solutions centre where SCADA systems, remote monitoring systems and control philosophies are developed for the control and automation of water treatment and waste water treatment plants. Because water treatment systems are sometimes remote and spread out, a monitoring system which is flexible and easily accessible is a great advantage. Such systems also reduce the need for permanent operators on site saving on time and cost. During the placement I had significant input into the development of these remote monitoring systems which can be accessed at any time world wide where there is internet access. The creation of these monitoring systems involved the mapping of addresses (associated with instruments on site) from the PLC to a telecommunications unit. Process and instrumentation drawings (P&ID's) were interpreted to produce a clear and simplified view of the plant. The system also alerts the raising of an alarm to the user via text message. The placement has been a valuable experience and the interaction with many elements of automation and instrumentation has served to connect topics studied in the course.

## Hanley Controls

Kevin O'Connell

Supervised by *Mr. Barry Glavin*



### Personal Details

After visiting the Applied Physics. & Inst. Dept. at the CIT open day, I saw how interesting the course was and the job opportunities that were available to graduates. After the first two years, I gained valuable knowledge about what the industry was going to be like. Now I am on my third year work placement with Hanley Calibrations. As a contractor, it involves travelling to many different factories through out Ireland and, I get a good idea of both the medical and pharmaceutical side of the industry. In my spare time I like to play Soccer watch films and enjoy all water activities.

### Placement Overview

Since I worked with Hanley Calibrations as an Instrument Technician last summer I asked if it would be possible to be placed with them again. This year there was more responsibility. I had been trained up on all their procedures e.g. Calibration, SOPs and GMPs safety and manual handling the previous summer so I knew how all the standards were used and how to document results correctly. My work experience started with a trip to Abbott Diagnostics in Sligo where I spend three weeks doing a scheduled list of quarterly calibrations. These calibrations included Temperature, Pressures, PH, Conductivity, Speed, Weight, Flow and Humidity. These are all the types of tasks I meet on a daily basis. Since Abbott I have been in Stryker Howmedica in Limerick, Alza in Cashel, Boston Scientific Clonmel, Pinewood Ballymacarby - Tipp, Pfizer (Inchera) Little Island, C&C Little Island. From all this travelling iv gained experience in both the medical Companies (Stryker Abbott Pinewood Boston Scientific) and the pharmaceutical companies (Pfizer Alza). As I move about I meet new instruments. I work from the office in Little Island if things get a busy as Hanleys offer an "In House" service as well and calling to the site.

## Zenith Technologies

Colm O'Leary

Supervised by *Mr. Sean O'Connor*



### Personal Details

Having completed my Higher Certificate in Applied Physics and Instrumentation I took up the option of working for my Ordinary Degree in the same subject.

I chose to follow this option because the year promised some very valuable work experience at the end of the year. This promised to be a great opportunity for me to gain experience of industry and also giving me some practical experience for my C.V. I completed my placement in Zenith Technologies in Ringaskiddy from March to May. Throughout this placement I gained valuable experience of the automation and pharmaceutical industry. I learned of all the procedures, documents and planning that goes into each project that is carried out. Next September I hope to enroll in the honours course in Instrumentation

In my spare time I am also an avid sports fan. I enjoy playing soccer, snooker and football.

### Placement Overview

The task that was set to me was to completely automate the Resource Allocation Sheet for the Human Resources Department of Zenith Technologies. This was to be done using Microsoft Excel. This was intended to improve the efficiency of the Human Resources Department by removing the need for manual calculations.

The first task I faced was to familiarise myself with the workings of Excel. Then I had to plan every step of the project. I learned about the validation command and how to work some of the calculation statements such as Sum and Countif.

This gave me an insight into the theory behind automation and also into the research that must be carried out on projects before they can be started.

## Pfizer

Rory O'Shea

Supervised by *Mr. Gavin Flynn*



### Personal Details

I started studying in third level education in Electronic Engineering where I graduated with an Ordinary Bachelor's Degree in 2005. I then went on to work for 18 months in the Electronic industry as an Electronic Technician. Then I decided to pursue my career in Applied Physic & Instrumentation. The reason for this was that the electronic industry was the uncertainty of employment and also a genuine interest developed in Process Engineering. I then applied to the Ordinary Bachelor's Degree in Applied Physics and Instrumentation where I was accepted into the third year of the course. During the third year I am now currently fulfilling my work placement which takes place for six months in Pfizer Active Pharmaceuticals and Ingredients.

### Placement Overview

I am currently working on an Energy Analysis Project where all electrical, water and gas intake is monitored throughout the plant on a daily, monthly and yearly basis. This projects objective is to ascertain the amount of energy intake the site is consuming each year and to find new ways of reducing energy usage on site which decreases energy costs. These objectives must be carried out while at the same time maintaining the process as efficiently as possible. I also currently work with the Pfizer Global Management System where all work and calibration orders are recorded and maintained on a weekly and monthly basis. Pfizer Loughbeg API employs over 300 colleagues at its site and manufactures the active ingredients for a drug called Lipitor. Pfizer Inc strives to keep its facilities up to date and state of the art by employing predictive preventative maintenance, it sets the standard in work safety and operates in a GMP environment.

ABB

Colin Power

Supervised by *Mr. Gary Luddy*



### Personal Details

Whilst in school I developed a keen interest in physics and as I am from an engineering family, studying Applied Physics and Instrumentation at CIT was a natural progression for me. I have always had an interest in instrumentation due to my part time work within HVAC (Heating Ventilation and Air Conditioning). This gave me some experience with instrumentation and working within the health care industry. I have found the course to be very industry orientated, bringing in a wide area of instrumentation and knowledge of control systems, and supported well from the third year work placement. While placed within the Instrumentation and Automation department of the ABB group I also gained the experience of the paper trail associated with working in the health care industry. With valued and limited free time I have my hobbies which include cycling, rugby and music.

### Placement Overview

As part of my placement I assisted engineers on the servicing and calibration of ABB instrumentation from chart recorders to flow meters. Calibration of emission analyzers and FTIR lab analyzers, which would be located at various sites from pharmaceutical plants to cement factories around Munster. The placement involved workshop repairs of equipment sent to the workshop as well.

While with ABB I was mostly involved on emission analyzers which monitor emission ejected into the atmosphere from incinerators as part of a licence which is given by the Environmental Protection Agency as to disposal of production waste by incineration. This also involved monitoring of emissions from boilers to comply with efficiency checks for the generation of plant steam or hot water. Some time was spent working with analytical lab analyzers which are used to determine quality factors such as water content of a production batch or for the identification of a powder product by means of reflectance from crystals lattices formed during the production process.

ProsCon

Stephen Randles

Supervised by *Mr. Conor Sobey*



### Personal Details

I started out by doing a 4 year apprenticeship in Electrical/Instrumentation with Pfizer Ireland Pharmaceuticals in Ringaskiddy from 1998 to 2002. While doing this I also completed a 3 year certificate in the City & Guilds 275 Industrial Measurement and Control by night. I then worked for 5 years in the Bio & Pharmaceutical industries as an Instrument Technician and Supervisor on both construction and commissioning on various different sites. During this time I also completed a 1 year night course in CIT in PLC programming. It was then I decided to go back to college full time to try and get a degree in Applied Physics & Instrumentation. I started the ordinary degree year last September and found it a huge challenge to try and get myself to the same level as the rest of the class seeing as it had been over 5 years since I completed the certificate and a lot of the subjects were completely new to me. I am currently on work placement with Proscon Automation.

### Placement Overview

Based in the Proscon offices in Carrigtohill Co. Cork. I was required to install and configure a redundant chassis on a new mobile panel which would be used to demonstrate to clients how the Allen-Bradley RSLogix 5563 redundant controller becomes the primary controller in the event of a fault on the original primary without affecting the I/O modules and their associated devices. It involved the installation of all the necessary hardware including controllers, Ethernet & Controlnet modules, I/O modules and communications cables.

The relevant software had to be installed / updated also. Ladder Logic code had to be written to simulate a row of digital output status lights switching on and off. The functionality of the redundant controller system was successfully demonstrated I also had to configure other modules and instruments on the panel including Remote I/O modules, pressure transmitters, a VFD and a Profibus/Ethernet transducer.

CIT

Darragh Reardon

Supervised by *Mr. Conor O'Farrell*



### Personal Details

I went into Electronic Engineering in CIT first in 2004 to do a three year course where one gets an ordinary degree. I was there until 2007 then after third year. I then switched over to the third year of Applied Physics and Instrumentation where I am at present doing my placement in CIT. This year I hope to obtain the BSc Ordinary Degree. My hobbies include soccer, reading and music.

### Placement Overview

This project is about getting a machine (called pigs) to move up and down a pipe. The pipe is cylinder in shape with two Perspex glass put into it. The movement is controlled by pneumatic actuators where air valves will pump air into the actuator to make them expand. We need expansion for the piston of the actuator to grip the pipe and the valves will take out air from the actuator for them to contract so that a controlled movement occurs. This movement of expansion and contraction moves the Perspex glass up and down the cylinder pipe in sequence of steps and three actuators will be used in each Perspex glass at 120 degrees also.

Blackrock Castle

Karim Saqi

Supervised by *Dr. Niall Smith*



### Personal Details

Having completed a Higher Certificate in "Physics measurement and Instrumental Techniques" in France, I wished to continue my studies in CIT through an Erasmus Exchange. By this, I could improve my English, have the possibility to obtain a 3rd year diploma and discover a country and its culture.

I have chosen the Applied Physics and Instrumentation Department of CIT because it is the ideal following course from my studies in France. I also had the possibility of attending the Dublin Institute of Technology but the program was designed more for physics than for instrumentation.

As part of my course in CIT, I went to Blackrock Castle Observatory to complete my placement. Having no knowledge in astrophysics before this placement I learned a lot about it.

My hobbies and Interests include Photography, Informatics and Running.

### Placement Overview

The project was conducted in the Blackrock Observatory. The objective was to design a program able to detect bright flashes from the sky which is a part of the OSETI project (Optical Search for Extraterrestrial Intelligence).

To detect flashes, we need to detect a luminosity variation. For that, we use an "avalanche photodiode": it is a very sensitive light sensor able to count each photon passing through it.

The photon counting is performed by the sensor software and the analysis of the data by the program I have developed with LabView. This last one is able to detect the number of flashes from a data file using 3 user configurable algorithms, graphs it and gives information about the flash type. We can then analyze more easily if the flash comes from a possible intelligent source or not.