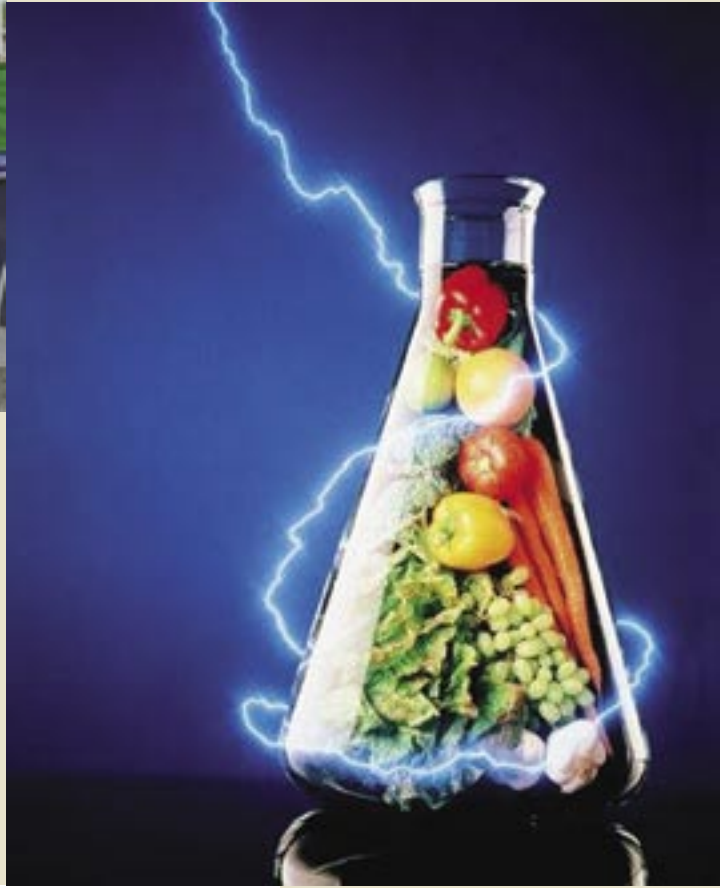




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**Working with
Science**



A science career is more than a job; it is a way of life. By working in a science-related profession you are committing yourself to a lifetime of personal achievement and directly contributing to, at the very least, the prosperity of your country and, at most, the benefit of man-kind. All scientists contribute to the world's wealth of knowledge. Science careers include all fields of science, engineering and medical science. Traditional science at secondary school is usually taught as biology, physics and chemistry. However, at tertiary level and in the work force, the lines have become increasingly blurred as more and more people specialise in interdisciplinary science such as biophysics, biochemistry, geophysics and geochemistry.

A science career usually pays a good income and it may involve adventure, or it may be on the cutting edge of technology. Working in science may rely on your personal skills and abilities such as communication, creativity, intelligence, application, persistence, dexterity, precision, objectivity, problem solving, comprehension, or mathematical skills.

Depending on your choices you may be working indoors or out. For example, a field geologist might spend many hours outdoors; some in very remote areas of New Zealand; some on the sides of volcanoes. However a field geologist might also be trapped indoors – in a submarine exploring the bottom of the ocean or in a deep mine!



Discovery Marine Ltd

Agricultural/Horticultural Scientist at a glance

<i>The job:</i>	<i>Study soils, breeding, animals' living conditions, crop protection, environmental sustainability, disease, and harvesting.</i>
<i>Qualifications:</i>	<i>A degree in science, agriculture or horticulture required</i>
<i>Where to Study:</i>	<i>Visit: http://www.kiwicareers.govt.nz/lists/courses/subject/s01a0two.htm http://www.kiwicareers.govt.nz/lists/courses/subject/s01d01.htm</i>
<i>Skills:</i>	<i>Research skills, able to analyse information and interpret scientific results. Oral and written skills also needed.</i>
<i>Personality:</i>	<i>Suits a person who enjoys the outdoors, although a lot of time is also spent in an office. Should be able to communicate with a range of people, from farmers to other scientists.</i>
<i>Travel:</i>	<i>Jobs in this profession are available worldwide.</i>
<i>To sum up:</i>	<i>In New Zealand agricultural scientists will always be needed.</i>

You might decide to be a microbiologist and work in a laboratory. You might choose to be a food technologist or food engineer and develop exciting new foods, or food machinery, in a factory, as one of our interviewees, **Alice van den Hout**, does. Many careers as research scientists require a masters or doctorate qualification. However, many exciting science-related careers can be started from the spring-board of an undergraduate degree combined with a post-graduate diploma. For examples, read about the exciting careers of **Declan Stubbing** and **James Ravenscroft**.

Biochemist at a glance

<i>The job:</i>	<i>Biochemists conduct research, develop new or improved products and processes, and test and evaluate the quality and safety of materials. They discover and develop new and improved synthetic fibres, paints, adhesives, drugs, cosmetics, electronic components, lubricants, and thousands of other products.</i>
<i>Qualifications:</i>	<i>A Bachelor of Science or a Diploma of Science are a minimum. Doctorates are increasingly required.</i>
<i>Where to Study:</i>	<i>Visit: http://www.kiwicareers.govt.nz/lists/courses/subject/s06b01.htm http://www.kiwicareers.govt.nz/lists/courses/subject/s06b0two.htm</i>
<i>Skills:</i>	<i>Know-how in the lab, analysing samples and interpreting scientific results, research and problem-solving skills, and planning and organisational ability. Computer and communication skills come in handy.</i>
<i>Personality:</i>	<i>A flexible team player and a desire to learn.</i>
<i>Travel:</i>	<i>A very portable career.</i>
<i>To sum up:</i>	<i>A career with opportunities in universities, crown research and private institutes and private companies.</i>

Botany/Plant science at a glance

<i>The job:</i>	<i>Botanists study plants and plant systems and may specialize in areas such as plant genetics, conservation, environmental biology, or taxonomy (the classification of plants and their relationships).</i>
<i>Qualifications:</i>	<i>A BSc or Masters degree is a minimum to entering this profession.</i>
<i>Where to Study:</i>	<i>Visit: http://www.kiwicareers.govt.nz/lists/courses/subject/s06b0three.htm</i>
<i>Skills:</i>	<i>Good at research, problem-solver and thorough. Written and communication skills are needed for presenting papers. Photographic skills are useful.</i>
<i>Personality:</i>	<i>If you enjoy the outdoors you'll enjoy botany, also suit person concerned about the environment and world food supply.</i>
<i>Travel:</i>	<i>Depending on who you work for, yes.</i>
<i>To sum up:</i>	<i>A job that is both fun to do and a benefit to others.</i>

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People in careers in science include aeronautical engineers, analytical chemists, aquaculture specialists, archaeologists, astronomers, biochemists, computer programmers, entomologists, food technologists, forensic scientists, glacial geologists, hydrologists, marine ecologists, mathematicians, medical scientists and researchers, nuclear physicists, organic chemists, palaeontologists, particle physicists, paediatricians, physicians, plant geneticists, plasma physicists, radiologists, robotics engineers, science teachers, science writers, surgeons, theoretical physicists, volcanologists, and wildlife biologists.

It would be impossible to list more than a small sample of possible careers in science in this Alpha, but simply typing “science careers” in a Google search will throw up hundreds of possibilities. Also, visit the websites of Futureintech (<http://www.futureintech.org.nz/>) and Kiwicareers (<http://www.kiwicareers.govt.nz>) to offer New Zealand-specific science occupations.

If you are planning to work in a science career you should plan to take Mathematics, science subjects (such as Chemistry, Physics and Biology) and English at secondary school. Although it may not seem obvious at first, English is very important as most scientists communicate their results to the rest of the world by the publication of papers and by speeches at conferences and symposiums. Even post-graduates working in the field or laboratory have to fill in reports and communicate their results to their peers and research managers, or, like our three interviewees, to explain their jobs to a lay audience.

As the 1933 Nobel Laureate in Physics, Erwin Schrodinger noted “If you cannot – in the long run – tell everyone what you have been doing, your doing has been worthless.”

In New Zealand, people are employed in science careers by the education sector, research organisations such as Crown Research Institutes, Government departments such as the Department of Conservation, Ministry of Agriculture, Ministry of Fisheries, or the Ministry of Research, Science and Technology, and the private sector, as are our three interviewees.

Forensic Scientist at a glance

<i>The job:</i>	<i>Use scientific knowledge and skills to investigate crimes. The information forensic scientists provide helps the police to find or eliminate crime suspects.</i>
<i>Qualifications:</i>	<i>Degree in chemistry, analytical chemistry, biology or genetics. PhD not essential but may help.</i>
<i>Where to Study:</i>	<i>Visit: http://www.kiwicareers.govt.nz/lists/courses/subject/s06b01.htm http://www.kiwicareers.govt.nz/lists/courses/subject/s06b0two.htm</i>
<i>Skills:</i>	<i>Computer literate, good observational skills, knowledge and experience of forensic techniques, good communication skills both written and verbal</i>
<i>Personality:</i>	<i>Willing to learn, patient, imaginative, dogged, meticulous, honest, capable of making responsible decisions, and be able to stand their ground in an argument</i>
<i>Travel:</i>	<i>Opportunities for travel with the job are possible, taking into account the different approaches to justice in different countries.</i>
<i>To sum up:</i>	<i>Use your scientific flair to bring criminals to justice.</i>

Alice van den Hout – Age 23

Working as:	Process Development Technologist
In a nutshell:	Being a Food engineer is a great role. I love the variety of projects that I can be involved with and most of all I enjoy the interaction with different people.
Why?	I am a passionate person and I once read that people leave their footprints in their area of passion (John Byrnes, Harvard Business school, 2005). I hope to leave mine in the dairy industry.

My daily work

I've recently moved up to Edgumbe after being in Edendale (Southland) for a year. My daily work revolves around process improvement and involves team meetings, observations and planning tasks. The focus for me is on product quality and improvement, energy savings or efficiencies. The general rule here at Fonterra is that remedies or improvements need to have a payback within two years. Of course, if the issue is Health and Safety, then there is immediacy about addressing this.

An example of a kind of project I'd be involved in is finding the root cause of process or product issues and developing the systems around them or altering the process to prevent the issues from happening again.



Early influences

Childhood provided a rich environment for an enquiring mind. My parents were Dutch and from an early age Dutch was the language spoken at home. It provided some challenges for my early acquisition of reading skills, made even harder by a learning disability that I eventually overcame. In the long term this only ended up benefiting me though, as I developed strong visualisation skills and attribute much of my analytical thinking to my early efforts to think in two languages. Observation also plays a key role in how I interact with people. I take in everything: the workplace culture, how people communicate, different leadership and management styles, etc. From there I am able to find the best way of working through a project with others.

School and University years

At Palmerston North Girls' High School, I studied the three sciences (Biology, Physics, and Chemistry) plus Math and Music. I remain extremely passionate about music. Camping, tramping, water sports, hockey and achieving the Queen's Guide Award nurtured my love of the outdoors. Outdoor activities are an excellent training ground for working in groups and fostering a healthy lifestyle.

Upon completing secondary school I enrolled in Massey University in Palmerston North in a B.Tech. However, I later transferred to an Engineering degree majoring in Food Engineering because I simply enjoy the engineering side of this field more. As I see it...

A Food Scientist is interested in the chemical properties of ingredients; what happens when they are heated, mixed together etc., along with how beneficial or otherwise they are to the consumer.

A Food Technologist makes the final product using the ingredients, testing to see if they behave the same way each time and examines the food's behaviour in a system. Food Technologists are interested in developing new products and packages to increase shelf-life.

A Food Engineer develops the processes for food products that will maintain the integrity of the food and structure, retain freshness and guard shelf life. A Food Engineer needs to know not only about food but engineering principles and physical effects as well. The engineer will design the plant that will process the product.

My final year project was the design and construction of a UHT system (Ultra Heat Treatment process – sterilising foods before packing to increase shelf-life). Near the end of my degree, I found that I was in high demand and had the choice of a range of jobs that had all been offered to me. After graduation I was offered a role on the Fonterra Graduate Technical Programme and was based in Palmerston North where I completed a Masters in Dairy Science Technology. The resulting research project was recognised by NZIFST as the best research project in 2004.

Upon completing my Masters with Fonterra I accepted a role as a Process Development Technologist at Edendale in Milk Powders, and have recently moved to Edgumbe into a similar role, but in Milk Treatment and Cream Products which involves processes and products which have some exciting technical challenges.



Future Leaders' Programme

For me the other exciting happening this year has been my involvement in the Auckland University Future Leaders' Programme. This is part of my professional development and it is an 18-month programme for future leaders (aged 17–25 years) and includes three-day residential workshops as well as weekly on-line forum and self-paced activities. For the first six months the focus was on self-development and we have just moved into the second phase of the programme; relationships.

I still find time to enjoy life and the outdoors and am absolutely loving my involvement with Guides New Zealand where I am a leader and outdoor adviser.

Advice for the Future

Find your passion, enjoy your study and value the friendships and working relationships. Life is great.

Enjoy your science, work hard and ask questions; the future for a food technologist is bright – there are lots of career paths out there.

Declan Stubbing – Age 23

Working as:	Hydrographic Surveyor for Discovery Marine Ltd (DML Surveys)
In a nutshell:	“My job is to map the sea floor which involves tidal studies, profiles of the sea bed and monitoring of changes.”
Why?	“I always give my friends who work up in those high rise buildings of downtown Auckland a wave when I'm out on the harbour to make them jealous!”

I went to Long Bay College where I studied Statistics, English, Physics, Graphics and PE in 7th form (Year 13).

It was a careers advisor who first suggested surveying to me as a possible career. After I did a bit of research into what the job is about I discovered that we had a very close family friend who was a surveyor. A day spent with him on the job and I was hooked! I packed my bags for Otago University and off I went.

I always knew I wanted to go to Otago, although originally I thought I would do PE down there. The chance to study in Dunedin is fabulous and the people I studied with were fabulous too.

In the end I decided to do my Intermediate Surveying year with some PE papers to see what I liked the most. Once I started I found that I really enjoyed the surveying so I kicked the PE into touch and carried on with the surveying.

I really enjoyed the degree but it was a lot of work and was quite tough – it's a professional degree so there is a lot to learn. It's great that there are only a small number of students, about 50 or so, therefore you get to know everyone else very well. You are all doing the same thing and working together.

I actually stayed on for a fifth year and did my Post Graduate Diploma in Science, which is how I ended up in Hydrographics. The course is based around the theoretical side of Hydrographics and is run through the International Hydrographic Organisation (IHO).

My job

I was employed by DML once I graduated last year, and I love the work. DML is contracted to work for the Ports of Auckland to oversee all the surveying of the ports around Auckland.

Apart from the Ports of Auckland we also have private clients. Lots of people are developing infrastructure in coastal marine areas, especially in the Gulf, and we also work for Regional Councils. We cover anything north of Taupo and up to Whangarei but we will work anywhere, for example we've had big jobs in Wellington and Queen Charlotte Sound.



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On average we spend one day on the water and two days in the office, but during summer we'll spend up to three days on the water if the weather is fine to make the most of it. We can't really work when the weather is unfavorable as it can affect the accuracy of the data.

During the winter I'm also contracted to work for Cato Bolam Consultants, to do land surveying and engineering when the weather isn't good enough to be out on the water. The work's fun and I can use the experience towards becoming a Licensed Cadastral Surveyor.

How we map the sea floor

We operate out of trailer boats to cover the inner coasts of New Zealand, using specialized software to fix our position using GPS. This is then matched up with the depth which we find using an echo sounder, and from this data we can create a graphical representation of where we've been.

We need to then "clean" that data by removing anything which gives a false reading, like seaweed or fish. We need to get a picture of a nice clean sea floor. This information is then either printed as a chart or rendered as a 3-D image for clients so they can visualise what the sea floor looks like.

Working with the sea bed

The sea floor is in a fairly dynamic environment and it's constantly changing. When we have ships coming in all of the time we need to know that areas in the port have not shoaled up. The consequence of a container ship grounding would be huge.

There are still a lot of NZ coastal regions which are un-chartered and which are used by commercial ships or pleasure boats which will need surveying in the future.

During big storms, wave action can have a huge affect on the seabed, especially on the bar in Manukau Harbour. The bar is constantly changing shape and we're still bringing huge ships in through that harbour entrance. We have to monitor the bar entrance every four months and if there is an especially big storm then we are asked to go out and check it, once the weather is more settled.

What it takes to be a Hydrographics Surveyor

You need to have a good understanding of the sea. I was brought up on the water and I just love being out there, so this is a big factor. I always give my friends who work up in those high rise buildings of downtown Auckland a wave when I'm out on the harbour to make them jealous!

You need to be methodical and practical as you need to gather as much data as possible while out on the water because it costs a lot of money to go out and do it again if you haven't gathered enough information or done it properly.

You do have to be flexible in this job as you can be out on the water all day when the weather is fine. It's not a 9 till 5 job.

There is a fair amount of reporting involved with this work as well. In the first year of the surveying degree there is a compulsory English paper which helps set you up for the report writing in this job, and which has made this part of the job much easier for me.

Why do you like the job?

It's fantastic to be out on the water and not stuck in an office on a nice day!

There is lots of travel with this job. I've done a couple of jobs offshore already and I haven't been out of university for one year yet! I worked in Palau which is a small group of Islands in Micronesia where we had to undertake a pre-dredge survey of a channel. I even managed to sneak in some diving for my personal interest while I was there, which was cool.

From here I think I'll be able to work in the oil and gas industries in the North Sea so I can travel while I work. This will give me a chance to earn good money, but I certainly see myself coming back to New Zealand to continue working in surveying after a stint overseas.

James Ravenscroft – Age 23

Working as:	Reliability Engineer with ABB Ltd, Kinleith
In a nutshell:	“I’m kind of like a technical consultant providing information so Area Managers can make good decisions.
Why?	“I was a real practical person, growing up on the farm, seeing how things worked and taking things to pieces.”

I’d never heard of a reliability engineer before I started, but maintenance is basically what I do. I’m a kind of technical consultant; I provide information so Area Managers can make good decisions.

My job is split into three areas. These are:

Root Cause Analysis (RCA) investigations, which are usually investigations into why a piece of equipment is not working properly. The reasons for this can sometimes be very complicated.

Maintenance Plan Reviews are where we look very carefully at what equipment is required to do, and develop a custom set of checks and maintenance strategies to get the best life out of it.

Reliability Projects involve small projects where things might not have gone wrong yet, but we can see ways to improve it and I’ll be providing the technical support for that.

A typical day

I’ll start at 8 o’clock with a meeting with production staff. I’ll print off all the information about what’s been going on the day before, for example, alarms going off etc... If there is a loss in production for any reason on the plant in my area, it’s logged on the database and I compile this information and go through it at the meeting. The rest of the day is usually spent working on the RCA investigations that arise from the meeting or other jobs.

Why engineering?

I was a real practical person, growing up on the farm, seeing how things worked and taking things to pieces. At college I found I was better at maths and physics than other subjects. I had some uncles who were engineers with high profile jobs. They were always travelling overseas and doing cool things. So, when someone said, “Why don’t you try engineering?” I thought I’d give it a go.

I went to Canterbury University. To start with, I wasn’t quite sure where I wanted to specialise – you can go into chemical, civil, electrical or mechanical, among other options, and based on some of the papers I did I thought mechanical was the most appealing. I like to see how things move and how things work, and it seems like there’s lot of different applications for mechanical engineering.

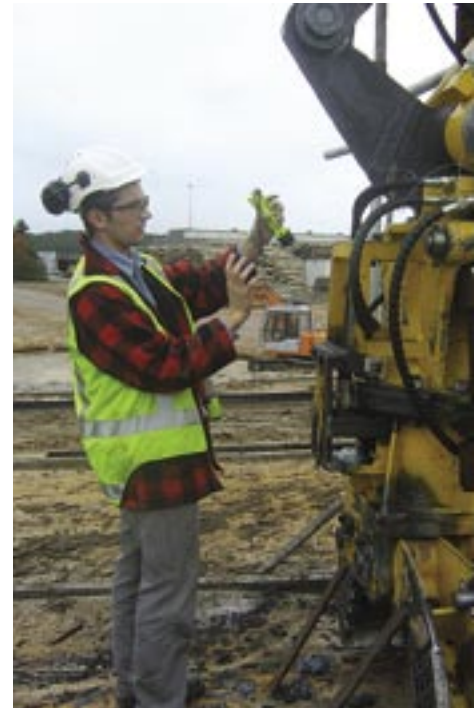


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Molecular Biologist at a glance

<i>The job:</i>	<i>Molecular biologists study tiny micro-organisms so that they can understand human, plant, and animal health. The new field of Bioinformatics uses computers to process genome sequencing data.</i>
<i>Qualifications:</i>	<i>Biological degree followed by an MSc or relevant PhD preferred. A NZ Certificate of Science may be acceptable to some employers.</i>
<i>Where to Study:</i>	<i>Visit: http://www.kiwicareers.govt.nz/lists/courses/subject/s06b01.htm http://www.kiwicareers.govt.nz/lists/courses/subject/s06b0two.htm</i>
<i>Skills:</i>	<i>Flexible and resourceful, in some jobs good with computers.</i>
<i>Personality:</i>	<i>Intelligent, creative, open, patient, attentive to detail and good with people</i>
<i>Travel:</i>	<i>Yes, multinational companies are always on the look out for molecular biologists</i>
<i>To sum up:</i>	<i>Go-getting graduates with the technical skills and a good commercial brain could go far.</i>

When I started at Canterbury University I wasn't quite sure where I wanted to specialise: chemical, civil, electrical or mechanical. There are a lot of options. It wasn't until after I'd tried a few papers of each that I settled on mechanical engineering, which I thought was the most appealing. I like to see how things move and work, and there's *lots* of work out there for mechanical engineers.

Getting into the workforce

I worked for my uncles while I was studying which gave me valuable practical experience and which benefited my study immensely. I even got to work overseas while I was still a student. I could see that engineering could lead to other career paths such as project management and I've seen that it's possible in this company (ABB Ltd) to go into a number of different fields. For instance, next year I am going to be working on a power station turbine overhaul project.



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Advice for others

Communication is really important in this job – I'm always talking to new people, sharing areas of expertise or liaising with suppliers or tradesmen. You've got to have detailed technical knowledge and an inquisitive frame of mind. You've also got to do a lot of things yourself and the majority of the time that involves fixing a problem and that sometimes requires creativity and innovation. Sometimes I catch myself thinking – how could this work better? Why is this happening? You need to be an inquisitive sort of person – to go in there and find out why and get right to the source of the problems, but with some good technical skills as well. You've got to know what you're talking about because people are relying on your information to make important decisions.

Physicist at a glance

<i>The job:</i>	<i>Physicists work in a variety of fields: they might look at problems at the frontiers of knowledge; others tackle the challenging problems which arise in the application of physical ideas to industrial and engineering problems</i>
<i>Qualifications:</i>	<i>Bachelor of science a minimum. Research jobs demand a masters or doctorate</i>
<i>Where to Study:</i>	<i>Visit: http://www.kiwicareers.govt.nz/lists/courses/subjects06a06.htm</i>
<i>Skills:</i>	<i>Logical skills, the ability to build and test models, numerical, analytical and problem solving skills</i>
<i>Personality:</i>	<i>Determination, creative thinker.</i>
<i>Travel:</i>	<i>Overseas there are opportunities</i>

References

Futureintech

<http://www.futureintech.org.nz/>. Futureintech is a Government-funded initiative of the Institution of Professional Engineers New Zealand, the professional body for the engineering profession.
www.ipenz.org.nz . Futureintech provided the profiles and job summaries for this Alpha.

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