HERE COMES THE SCIENCE BIT

A REVIEW BY L'ORÉAL OF SKIN SCIENCE AND WHAT'S TO COME

Mintel

Beauty & Personal Care

L'Oréal

UK AND IRELAND
Welcome to Skincare

L’Oréal & Skin Science

Skincare: Behind the Lab Doors
- Reconstructed Skin
- The Heart Of L’Oréal
- Fundamental Research
- Ingredients & Formulation
- Safety & Clinical Trials

The Consumer Quest for Healthy & Youthful Skin

The Future

The Facial Care Market is one of the biggest and fastest growing beauty categories in the UK. Indeed, latest Mintel research reveals the importance that British consumers place on skincare, with the category defying economic conditions to generate £956 million in 2011 and - crucially - forecast to break the £1 billion mark in 2013.

More than nine out of 10 (94%) women in Britain today use facial skincare products, and cleansing creams, make-up removers are used by eight in 10 (81%). The future also looks bright for the UK skincare market - as Mintel estimates it will grow beyond the billion mark to reach £1.2 billion by 2015.

But while women in Britain are forecast to spend more than ever before on the facial skincare, Mintel’s research reveals that they are expecting what they buy to achieve results. Some 35% of women agree that skincare products developed by dermatologists and facialists are better than regular ones. Furthermore, today, over one in five (22%) of British women use anti-ageing products and one in 10 (9%) like to try skincare products with the latest scientific ingredients.

Women are still the major users of face and body products and have become well-versed in the changing language of skincare in recent years. Words such as retinol and hyaluronic acid and phrases such as ‘probiotic technology’ are seen everywhere and have become synonymous with both the industry and a more knowledgeable and demanding consumer.

Products have come a long way too. The first mass-market skin creams, launched 30 years ago, were effective because they kept the skin hydrated – a vital element in skin health. These creams used ingredients that we might consider basic today but which have been part of an evolving ingredient palette, developed over the best part of a century by the industry. The essential component of each ingredient was that it locked water into the skin: these creams were first developed for morning application, then later, for use at night.

After these effective moisturisers came products which contain specific molecules, such as jasmonic acid. The explosion of new-generation serums and creams, now hitting the market, marks a development in skin care, in which extensive scientific understanding of the physiology and biology of the skin has led to the development of products which target particular aspects of skin function.

Today, the skincare industry faces a new dawn as companies such as L’Oréal are developing the next generation of skincare products. Thanks in part to new knowledge, such as that uncovered by the Human Genome Project and new technologies, principally in molecular biology, there is now extensive understanding of the principal pathways in skin ageing.

Source: Mintel’s Facial Skincare - UK - 2012 report
To mark the 30th anniversary of the launch of the company’s biggest mass-market skincare product, L’Oréal Paris Revitalift, L’Oréal publishes this report on skincare in the 21st century and beyond.

This report shows the depth and breadth of the science underlying L’Oréal products. It shows the extraordinary range of different sciences needed to understand how the skin ages and introduces you to the people who translate this science into ground-breaking new skincare products that meet consumers’ needs.

And it explores the future. What advances in skincare are ahead? What is next for the industry? How will developments in science change our skincare habits and what products will we be using in the years ahead?

To answer some of these questions, let’s go through the laboratory doors at L’Oréal, the world’s largest cosmetics company, meet some of the key scientists who are creating a new generation of skincare products and find out more about what the future has to offer.

‘AND WHY IS THE PURSUIT OF YOUTHFUL SKINCARE SO IMPORTANT? SKINCARE HAS A HUGELY POSITIVE EFFECT ON THE WAY WE FEEL ABOUT OURSELVES. IF WE LOOK OUR BEST, WE FEEL TERRIFIC.’

LUCY BERESFORD, INDEPENDENT PSYCHOTHERAPIST

To the skin the largest organ in the human body

Skin is the largest organ in the human body

Skin has incredible elastic properties. A wind tunnel test showed that it can absorb winds of up to 350mph and still return to its original state

There is no such thing as black or white skin. Its tone is defined by melanin, a pigment produced deep in the skin. The amount of melanin that your body generates is decided by your genes

Skin is the largest organ in the human body

The skin of an average person weighs more than half a stone and its total surface area can be up to two square metres

Skin regenerates itself every 28 days

It contains 200,000 nerve endings which act as an alarm system for the rest of the body and help regulate body temperature

The very top layer of skin that we all see every day is known by scientists as the ‘horny layer’. It is only one-hundredth of a millimetre in thickness

The top layer of skin, the epidermis, is at its thinnest on your eyelids (0.05mm in thickness) and thickest on the sole of your foot (1.5mm in thickness)

‘And why is the pursuit of youthful skincare so important? Skincare has a hugely positive effect on the way we feel about ourselves. If we look our best, we feel terrific.’

Lucy Beresford, Independent Psychotherapist

DID YOU KNOW?

Young Skin

Aging Skin
Discover the main facts and figures regarding research & innovation

3,676 employees of 60 different nationalities working in 30 different disciplines

€721 million dedicated to cosmetic and dermatological research in 2011

19 research centres in 6 hubs

16 evaluation centres

50 scientific and regulatory departments

1/3 of the research & innovation budget devoted to advanced research

613 patents filed in 2011

100 active cooperation agreements with leading academic and research institutions

3,676

research and innovation employees of 60 different nationalities working in 30 different disciplines

L’Oréal & Skin Science

Science has always been at the heart of L’Oréal, ever since the company was founded by a chemist more than 100 years ago. Science is also leading its future. Discoveries made by the company’s Advanced Research Division and its team of 3,700 L’Oréal scientists are responsible for both the safety and efficacy of current skincare products and the development of an innovative pipeline of new concepts and products.

L’Oréal’s work in the field of science is regarded as world-leading. Its scientists regularly publish the results of their latest findings and discoveries in the most highly regarded journals. They also present their papers at keynote conferences across the world.

Yet people often assume the beauty industry is based on all hype and no substance. There are many reasons for this. For instance, we tend to disregard the science behind products that are very familiar, which we use every day. And there is undoubtedly a culture in which the pursuit of beauty is deemed to be inherently trivial, in which the use of anti-ageing products is perceived as a foolish quest for youthfulness by those old enough to know better. In this case, the association of beauty with cosmetics is sufficient to undermine or trivialise the quality of scientific research undertaken on anti-ageing.

In addition, science’s case is further eroded by the difficulties of communicating complex scientific facts within the tight word counts of advertising or marketing material and also by the widespread and flagrant misuse of scientific claims, particularly on the Internet. Finally, despite skin being the largest organ of the body and critical to survival, few people know much about its function and structure.

Without understanding the basic biology of the skin, there can be no advances in skincare. Without developing new tools and technologies for investigation, evaluation and prediction, there would be no new products. This is why L’Oréal is so committed to fundamental research.

A healthy skincare regime is anything but frivolous.

Good self-care — and that includes care of our skin, the largest organ in our body — is an essential indicator of our mental well-being.

Lucy Bersford, psychotherapist

Healthy skin is assumed to be simple and completely understood, when in fact, it is highly complex and much has yet to be discovered

L’Oréal’s latest advances in skin science

• UVA plays a key role in skin ageing
• L’Oréal develops a new tool to prove that the number of stem cells in the epidermis does not diminish with age; old skin repairs itself just as well as young skin. It just takes longer to do so
• Fibroblasts are mostly responsible for the pigmentation process — which affects the colour of our skin and the amount of spots or marks we have. Until then scientists always thought that only melanocytes were the key player
• L’Oréal discovers that the origin of most signs of ageing, such as wrinkles and sagging, can be found just below the skin’s visible layer — not at the surface or deep down in lower layers of the skin
• L’Oréal maps every possible shade of skin on earth. The total number is 63
BEHIND EVERY SINGLE PRODUCT THERE IS A HUGE TEAM OF RESEARCHERS, POURING THEIR HEART AND SOUL INTO THEIR SCIENCE TO CREATE MARKET-LEADING SKINCARE PRODUCTS. THE TIMELINES ARE ASTONISHING. THREE DECADES OF RESEARCH, FOLLOWED BY TEN YEARS OF PRODUCT DEVELOPMENT, ARE NOT UNUSUAL IN THE CREATION OF A NEW SKIN CARE CREAM OR SERUM. HUNDREDS OF DIFFERENT STEPS TAKE PLACE, INVOLVING MANY TEAMS OF SCIENTIFIC SPECIALISTS IN L’ORÉAL’S OWN LABORATORIES AROUND THE WORLD, AS WELL AS EXTERNAL EXPERTS FROM ACADEMIC INSTITUTIONS AND HOSPITALS.

The following section highlights some of the main research, innovation and testing that takes place in the development of a new skincare product.

L’Oréal’s science teams work within three key areas: developing the ingredients, scientifically evaluating and assessing them, and evaluating them with consumers.
HOW IT WORKS

The epidermis is the uppermost compartment of the skin. Formed of many layers, cells generated at its base move upwards as if on a continuous vertical conveyor belt, changing shape as they do so, until they reach the surface, where they are shed as dead skin. Episkin models are obtained by culturing the predominant cells of the epidermis, adult human keratinocytes. These come from the discarded breast or abdominal tissue of healthy consenting donors undergoing plastic surgery.

The cells are seeded onto a collagen matrix and immersed in fluid for three days where they proliferate, expanding in a flat layer. This is then exposed to air for ten days and the cells begin to move upwards, as they do in life, forming a tough horny layer. To test the safety of cosmetics, product is applied to the top layer. Then, after a set time, a yellow chemical called MTT is applied, which turns blue in the presence of living tissue.

RECONSTRUCTING SKIN
THE HEART OF L’ORÉAL

AT THE VERY HEART OF L’ORÉAL’S DEEP KNOWLEDGE OF SKIN IS TISSUE ENGINEERING.

It is the brainchild of researchers at one of L’Oréal’s laboratories. Reconstructed skin is grown from cells harvested from the top layer of pieces of skin and is used to evaluate the safety of new products. Tissue engineering has now been adopted by scientists both inside and outside the cosmetic field.

Forty years ago we knew very little about skin’s physiology. Was it possible to grow skin in the lab that looked and behaved like the real thing? Two L’Oréal scientists responded to this need and, in 1975, were able to demonstrate the first true skin grown in vitro, before any other living organ had been reconstructed. Much more research followed and in the late 1980s, thanks to a team of young scientists in Lyon, France, the first reconstructed model of the epidermis was perfected.

It was soon clear that reconstructed skin also had enormous potential for use in toxicology studies. The development of tissue engineering is the reason that L’Oréal was able to abandon animal testing on its finished products more than 20 years ago, way ahead of other companies.

By 1997, L’Oréal had developed a kit to create the Episkin model, consisting of 12 well plates, each containing an epidermal model. In 1998, the European Centre for the Validation of Alternative Methods (ECVAM) validated it as an alternative method for skin corrosion tests and this technology was made available commercially.

L’Oréal then acquired another tissue engineering company, SkinEthic, through which a number of reconstructed skin models – including Episkin – are now sold to industry and academia.

In 2007, ECVAM validated these models as an alternative test for skin irritation in vitro. These have been critical to the enactment of the EU’s REACH regulations which called for testing of many more chemicals but also forbade animal testing for cosmetics.

Meanwhile, L’Oréal continued to refine and develop more advanced models, which it uses internally. They provide an unrivalled, world-leading platform for research, innovation and product development. For instance, by introducing the pigmented cells of the skin, melanocytes, into the model, it is possible to tan skin in the lab and so use it to test the efficacy of sun filters.

The use of reconstructed skin models has given L’Oréal researchers the tools to build up an unrivalled knowledge of the structure and physiology of normal human skin. TISSUE ENGINEERING IS THE REASON THAT L’ORÉAL WAS ABLE TO ABANDON ANIMAL TESTING ON ITS FINISHED PRODUCTS OVER 20 YEARS AGO, WAY AHEAD OF OTHER COMPANIES

THE USE OF RECONSTRUCTED SKIN MODELS HAS GIVEN L’ORÉAL AN UNRIVALLED KNOWLEDGE OF THE STRUCTURE AND PHYSIOLOGY OF NORMAL HUMAN SKIN.
new active ingredients and to provide a better understanding of how new products might work. She finds that scientists who work outside dermatology are sometimes surprised by the extent and quality of research in cosmetics. “But within dermatology, my colleagues are known worldwide for their science,” she adds.

A molecular biologist by training, Dr. Carine Tornier has studied biochemistry, biology, pharmacology and molecular genetics in Nice, Strasbourg and Bordeaux. She originally joined the company over 11 years ago and worked for L’Oréal on the development of protocols using a human reconstructed corneal model. In the past, rabbits were used for testing the eye irritation potential of products such as shampoo, and a viable alternative was very badly needed. But technically, it was extremely challenging. It wasn’t until 2002 that the model became available in a commercial form. Now it is used throughout the world to test ocular irritation. Carine loves what she does: “It’s very exciting to have been able to contribute to the development of an ethical model to replace animal testing.”

She is now responsible for assessing and re-assessing alternative testing methods to make sure that they work effectively. This involves her working closely with colleagues to ensure that the methods she helped develop are as robust as they should be.

THE SKIN RECONSTRUCTORS:
Dr. Estelle Tinois-Tessonneaud, Christine Duval, Annie Black & Carine Tornier

Dr. Estelle Tinois-Tessonneaud was central to the development of alternative testing methods. Her PhD was in skin culture and she was part of the launch team who developed the Episkin model while working for a small company in Lyon, called Imedex. L’Oréal immediately saw the potential of the work and acquired the company in 1997. It was a pivotal moment. During this period, in L’Oréal’s advanced research labs, Marcelle Regnier was leading a laboratory team dedicated to reconstructed skin models. In those days, Estelle had five scientists working with her, but is now part of a workforce of more than 60 scientists. L’Oréal’s £13 million state-of-the-art Predictive Evaluation Centre has more than 1,000 square metres of clean rooms. “I’m very proud to have been part of the team that developed the model, and that it’s been used worldwide,” says Estelle. “And I’m very proud that what I discovered as a young researcher is still being used today.” L’Oréal has always been ahead of the curve in the development of skin models. Future model use for safety evaluation depends on decisions that will be made by the European Centre for Validation of Alternative Methods. Meanwhile, L’Oréal has been developing state-of-the-art computer technology that records data from millions of tests previously undertaken, and will enable scientists to predict the results of much of the standard tests. If this technology is validated, no tests on animals will be necessary and the reduced innovation time means that new products will reach department store counters or the High Street more quickly.

Dr. Christine Duval is a French-born biologist who specialises in melanocytes, the pigment cells of the epidermis. It is the level of activity of these cells which is mainly responsible for the differences in skin pigmentation in people across the world. “But melanocytes do not function alone and we now know, through our work, that they are under the control of other skin cells, especially the keratinocytes and the fibroblasts. We also know that when the equilibrium between these cells is altered, this can lead to the development of age spots.”

Dr. Duval has been responsible for a new reconstructed skin model which contains melanocytes and keratinocytes as well as fibroblasts, and therefore mimics the physiological situation very well. It’s another L’Oréal first. Christine says: “It should help us answer some fundamental questions, such as how the pigmentation of the skin is normally regulated, what happens in response to UV light, how age spots develop and whether we can alter their production.”

Dr. Annie Black is another key player in the development of next-generation skin models. A French Canadian with a background in the production of skin for burns victims, she helps develop models which can be used to test potentially new active ingredients and to provide a better understanding of how new products might work. She finds that scientists who work outside dermatology are sometimes surprised by the extent and quality of research in cosmetics. “But within dermatology, my colleagues are known worldwide for their science,” she adds.

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Today’s skincare products are the result of peer-reviewed scientific studies. L’Oréal scientists publish in high impact journals and its scientists are named authors on over 80 independently-reviewed scientific papers each year. Its teams of researchers share latest research findings and relevant discoveries with more than 100 universities, hospitals and other scientific institutions around the world.

The L’Oréal Group presents the results of its research at 50 scientific conferences every year, including the World Congress of Dermatology, The European Society of Dermatological Research, and The Anti-Ageing Skin Care Conference.

A selection of key publications can be found at www.skin-science.com

Many people are surprised by the depth and strength of L’Oréal’s research. More akin to a university department, its Advanced Research Division, based across six sites in Ausinay, Tours, Lyon, Tokyo, Pudong and Bangalore, employs a very wide range of scientists. Some, such as cell biologists, physicists and other life scientists, might be expected, but it is the extent of expertise contributed by other disciplines, including physics, chemistry, engineering and maths, that is noteworthy.

The highly collaborative interdisciplinary approach, combined with access to new technologies, ensures a constant stream of discovery and innovation.

GLOBALLY RESPECTED RESEARCH

THE STEM CELL SCIENTIST: Dr Michelle Rathman-Josserand

Dr Michelle Rathman-Josserand, an American native of Montana and a microbiologist by training, came to L’Oréal after a foray at Stanford and then the Institut Pasteur in Paris. She contributed significantly to the advancement of the company’s stem cell programme, which has dedicated laboratories in France and began over 10 years ago. Stem cell biology is a subject of intense interest at L’Oréal and the company’s research is geared at both understanding skin and hair regeneration processes and identifying novel active ingredients that protect or optimise stem cell function.

The first stem cell-related breakthrough for L’Oréal was the discovery that hair follicle keratinocyte populations, including stem cells, are capable of generating epidermis in vitro. Michelle’s work has involved understanding the characteristics of the niches or microenvironments in the skin and hair that nurture stem cells and the communication systems that control the regenerative process. She, and her team, have developed new tools and models to understand how the stem and progenitor cells are modified during ageing. By carrying out tests on reconstructed skin and on a number of different stem cell models, the work of Michelle and her team has opened up the possibility that in the future we may be able to keep skin generating as well when we are 50 as it did when we were 20. For Michelle, the future is endless. Biotechnology in cosmetics unlocks two very exciting opportunities: firstly, to make beauty products more sustainable by producing hundreds of raw ingredients from a single leaf, and secondly, using this innovation to mass produce consistently high-quality, natural ingredients from a single source. Michelle’s dream will mean that the quality of her ingredients will soon be less reliant on external factors such as the weather or other environmental constraints.

THE NEXT-GENERATION SCIENTIST: Dr Mark Donovan

A senior scientist working in proteomics and glycobiology (the science of complex sugars), Dr Mark Donovan joined the company just as proteomics was really taking off in 2003. Omics is the study of all - for instance, all the genes (genomics) or all the proteins (proteomics) found in a particular place or at a particular time. These new tools made it possible to see which genes were working in skin, and under what circumstances, and L’Oréal quickly established that there were differences between genes that were active in younger skin compared with those in older skin.

“It really helped us deepen our knowledge of skin biology,” says Mark. This knowledge is crucial in the development of new concepts and potentially new active ingredients. Like many L’Oréal researchers, he works at the cutting edge, making discoveries new to science. “We discovered the presence of a particular glycan (a complex sugar) in the stratum corneum. It had never been reported before,” he adds. Skin glycans are a focus of research because they play a critical role in the signalling between cells and in the structure of the skin.

“We’ve only just scraped the surface of what we can achieve with glycobiology and omics. In the coming years, we’ll see new products based on these emerging areas of science that will deliver new ways of keeping skin looking healthy at all ages. I am sure that we’ll also be able to use them to help tomorrow’s consumers personalise their skincare routines.”

THE PIGMENTATION BIOLOGIST: Dr Sandra del Bino

Dr del Bino is half Italian, half Belgian. She came to L’Oréal with a background in keratins, the proteins best known for being the stuff of skin, nails and hair. “They are fascinating,” says Sandra, “and their production varies in different conditions, for instance, when UV light hits skin. Now my work principally involves the basic biology of skin diversity and in particular how to evaluate it.”

She explains that in the past, there were deemed to be only six skin colours - one was simply Asian - a ridiculous concept, given that there is clearly huge variation within this single category alone. Her skin colour scale methodology, which is now used all over the world, involves the objective measurement of two parameters.

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We first look for commercially available instruments for assessment. He says: “When we need to evaluate something and microscopy, and the development of new physical methods leads the department of Physics within L’Oréal's Advanced Research team.”

**THE BIOpHYSICIST:** Dr Frédéric Leroy

Dr. Frédéric Leroy is an analytical chemist by training and today leads the department of Physics within L’Oréal’s Advanced Research team. His work encompasses both the understanding of the physical behaviour of skin as a material, using imaging and microscopy, and the development of new physical methods for assessment. He says: “When we need to evaluate something new, we first look for commercially available instruments and if nothing is available, we invent or adapt what we need ourselves. For instance, multi-photon microscopy allows you to see inside the skin, but the images it provides are not entirely suitable. So we developed important new software to optimise it for skin use. These new methods are critical in the selection of new active ingredients and give us a big advantage over our competitors.”

“Engineering is a key element of gaining a deeper understanding of human skin. In recent years, a wide range of technological equipment has been developed to investigate in detail the levels of the skin, how it changes with age, environment and a whole host of other factors. In its labs in Paris, L’Oréal has patented a wide range of different tools that are used to build a 3D image of the skin and how it works, without having to perform surgery. As a result, the company has discovered many signs of ageing take place in the very top layers of the skin. Frédéric is rightly proud when the products he has helped develop hit the shelves of beauty counters and supermarkets. He will be even prouder when the tools he has helped develop become commercially available to enable scientists to make breakthroughs in other areas of science.”

**THE ENGINEER: Dr. Frédéric Flament**

An engineer by training, Dr. Frédéric Flament works at the interface of biology, physics and engineering and in the space between what can be measured and what is perceived by our senses. He develops new equipment for analysis and evaluation of the skin, working with technical partners in universities across the world. His tools range from small probes to microscopes the size of a small room. Their purpose can be broad, such as evaluating the response of skin when stressed, or very specific such as measuring how the skin reflects light. A major challenge has been to develop an objective method to evaluate skin across and within ethnic groups. “Every day brings a new challenge. I need to surround myself with people, ideas, meetings and discussions,” says Frédéric.

Dr. Flament’s machines are used in the company’s clinical trials and to ensure that what we tell consumers about our products is accurate. He has also been very involved in the development and production of the Group’s Skin Ageing Atlas (in three volumes covering Asian, Caucasian and African-American skin types) which has become the bible for professional dermatological assessment. It was developed using validated instrumentation to assess skin ageing objectively. Without such work, it would be impossible to measure the efficacy of anti-ageing strategies. It is acknowledged as a major contribution to dermatology.

**THE COLOUR EXPERT: Dr. Laurence Cayse**

Dr Laurence Cayse started her career with L’Oréal 23 years ago and now works at the company’s Research & Innovation Department in Clark, New Jersey, USA. She trained as an optical engineer and has a masters in physics and is now a leading researcher in the field of skin colour.

“When I started at L’Oréal, we understood that skin colour was an important factor. At that time we were studying it with tools such as the colorimeter that had been developed by the paint industry. However, painted surfaces are opaque and tend to have an even surface. The skin’s surface couldn’t be further from that.”

“Just because two different women seem to have the same skin tone, it doesn’t mean they will need the same make-up or skincare routine. It depends on the look that they want to achieve, their culture, their age and skin condition.” Cayse has developed 63 charts to characterise skin types around the world.

Based on her expertise as an engineer, Laurence turned to other industries to develop new equipment that would provide a much more accurate measure of skin tone. In the early nineties she developed and patented the chromahere, which for the first time was able to measure the color of skin by shining an even source of light across the whole face. It created a totally new way of understanding how the colour of skin was linked to the agency process and how product performance and reflection were linked. Her chromahere has been used by leading scientists to map every possible shade of skin and to understand the signs of ageing among all cultures worldwide.

Cayse’s developments have also helped L’Oréal to develop skincare products that provide an “instant” result by reflecting light and to better understand the global diversity of skin types. Her equipment has now been installed in every L’Oréal laboratory around the world. She has since turned to the automotive and military industries to patent two other tools that can assess the 3D properties of the skin’s surface. She has just finished working with a Russian institute to produce an “atlas of lips” – the first of its kind.

When turning to the future, Cayse says, “I love exploring different countries and cultures – my job gives me every opportunity to do that. There are many things that start off as being impossible but we can turn anything around. We have learned a lot about interracial breeding but there’s still more to learn. I think we’ve discovered all that there is to discover in terms of skin tones but we have plenty more to investigate.”
L’ORÉAL WAS FOUNDED BY A YOUNG CHEMIST CALLED EUGÈNE SCHUeller IN 1909 AND CHEMISTRY STILL CONTINUES TO PLAY A MAJOR ROLE IN THE SUCCESS OF THE COMPANY TODAY.

A product may contain one of several active ingredients - and there is a constant search for new actives - but there is still much work to do. The ingredient must be in a form that is not only safe, bioavailable and reaches the intended site of action, but that the end user wants to use and finds attractive.

Pioneering efforts in engineering have led to the development of new testing equipment, that in turn has resulted in a gold rush of new ingredients. Finding ‘breakthrough’ ingredients is only half the story. In many of the latest developments in the skincare science, the structure of these ingredients usually needs to be changed scientifically, rather like folding a sheet of paper into an aeroplane so that it can travel through the air.

SEARCHING FOR NEW INGREDIENTS
Finding Skincare’s Holy Grail

THE INGREDIENT INVESTIGATOR: Dr Rui Pereira

Evaluating potentially new biologically active ingredients of the future, is the job of Dr Rui Pereira who heads a team of over 100 people involved in this high-tech area. He joined L’Oréal after a long stint of studying in the UK, then obtained his PhD thesis in molecular biology and biochemistry at University College London.

Today, Rui’s team uses ‘high throughput screening’, combined with computational techniques more familiarly used in the pharmaceutical industry for drug discovery. His team screens literally tens of thousands of samples every year. Most of the time, the biological activities of these samples are unknown and his teams evaluate their potential.

Many L’Oréal researchers work on understanding how skin functions and reacts to different environmental factors and stimuli, giving rise to the identification of new biological targets. These researchers then ask Rui’s team if they can find them a molecule with a very specific action. It might seem a simple request, but when his team and a team of chemists were asked for something that might inhibit melanin production, they started with a list of more than 400,000 potential molecules, and narrowed it down to 37,000 to be tested. Then, using a range of in vitro testing technologies, the team identified 3,000 which showed some activity before being reduced to 120 for further study. Rui and his team have been instrumental in finding the next generation of ingredients, such as LR2412 jasmonic acid derivative, which is found in many of the latest developments in skincare science.

But at this point, the baton had to be handed back to the biologists and bio-physicists. First, rhamnose was tested with a reconstructed skin model that had helped pinpoint the importance of papillary fibroblasts. Researchers were looking for evidence of efficacy at a microscopic and at a molecular level.

When cells are doing something, or producing a molecule, it may not be possible to measure their output in a direct way. Instead, scientists look for rises in specific biological markers, molecules that are recognised proxies of cell activity: one for example in skin cells is an increase in the amount of pro-collagen being made by the cells. These lab studies showed that rhamnose was indeed prompting activity - rhamnose - a plant sugar extracted from a species of uncaria, a Brazilian plant also known as cat’s claw. It is already recognised for having soothing properties. At a 5% concentration, laboratory studies suggested that rhamnose molecules were able to ‘dock’ in specific receptors and so affect the activity of fibroblasts.

Rhamnose and Vichy Liftactiv

Adopting techniques now widely used by the pharmaceutical industry to search through thousands of molecules for potential new medicines, Rui and his team were able to screen over 50 potential ingredients using high throughput computer sequencing. One particular ingredient seemed to have a major effect on the activity of fibroblasts - rhamnose - a plant sugar extracted from a species of uncaria, a Brazilian plant also known as cat’s claw. It is already recognised for having soothing properties. At a 5% concentration, laboratory studies suggested that rhamnose molecules were able to ‘dock’ in specific receptors and so affect the activity of fibroblasts.

Rhamnose was then tested by scientists using a medical research standard type protocol, in which products containing rhamnose were compared against placebo double blind (so neither researchers nor subjects knew whether the product they had contained it or not). These studies established that the products are effective at reducing clinical signs of ageing, and so forth.

Rhamnose is the subject of seven patents and first appeared in the Vichy Liftactiv Derm Source range of products.

A further double blind controlled trial involved 66 women aged 55 - 70 yrs using the product on one side of the face only, and on one side of specific body sites (décolleté, arms, hands), with a reduction in visible signs of ageing as an end point. These are not subjective measures by the women involved but very precise determinants, objectively measured, using standard dermatological protocols and technologies. For instance, there is an optical assessment of skin colour and tone using a device called a chromasphere.

Finally there were seven clinical studies of the final formulated product, conducted under the control of a dermatologist, which involved 127 women throughout the world, both Caucasian and Asian subjects. These studies established that the products are effective at reducing clinical signs of ageing.

Resistance and shelf life

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After two months, biopsies were taken and assessed.
The Biotechnologist: Dr Patrick Choisy

Dr Patrick Choisy works in the laboratories in Tours. He is a fermentation biologist with experience of producing enzymes through biotechnology. He is charged with developing new raw materials from micro-organisms and plants. About 55 per cent of L’Oréal’s new ingredients come from plants. These clearly should not be taken from the wild, where there are concerns about the amount of water used for irrigation, about the use of pesticides, and about the reproducibility and quality of ingredients from year to year. Biotechnology is one answer. Not only can plant cells be cultured to become mini-plant factories constantly turning out a particular ingredient of perfect quality, but their environment can be manipulated in order to look for potentially new ingredients that may not be apparent in field-grown plants under conventional conditions. Patrick has been essential to the development of the whole rose stem cell preparation used in Lancôme’s Absolue Extrait. Interestingly, rather than using just one ingredient in Absolue Extrait, a whole cell approach has been adopted, which is more similar to the multi-faceted way that tissues operate in real life.

The Sun Chaser: Dr Martin Josso

Opinion is divided as to whether cosmetic formulation is an art or a science but there is definitely something of the alchemist about formulation chemist, Dr Martin Josso. “My job is to find something for the public that really meets their needs but which they may not yet know they want,” says Dr Josso. He gives the example of Anthelios 50, a La Roche-Posay sunscreen that was extremely effective but had a rather sticky feel on the skin. “I was intrigued by a Japanese technology called shaka-shaka (which uses a small ball bearing within the bottle to emulsify the contents). The combination of shaka shaka and a bit of formulation magic now means Anthelios is light and easily applied.”

Another example of meeting consumers’ needs is the development of Vichy Capital Soleil Sun Oil. Many people, particularly in South America, prefer to use sunscreen oils, despite knowing that they have low levels of SPFs. Recently, however, Josso and his team developed a formulation that combines an oil base with high protection and this product, Vichy Capital Soleil Sun Oil, has already been launched in Brazil. “I was never satisfied by my job until I joined L’Oréal. Now I’m very happy,” says Dr Josso.

The future for Dr Josso lies in developing even more formulations for different needs. Sun protection oils are now popular with men because they no longer have to apply creamy formulations to their bodies if they are hairy. In the future, Dr Josso may well discover new ways of adding sun protection and other high performing ingredients to favourite facial products, such as serums.

The Formulation Chemist: Dr Catherine Marion

Dr Catherine Marion is a chemist but many of her family are artists. At L’Oréal, she is able to use her creativity to create products and innovative concepts. “It’s true, there is an art to formulation,” says Dr Marion. When a molecule with good biological activity has been identified and tested in the lab, the formulation specialists begin their work. Dr Marion specialises in the texture and smell of products. “Smell is very important in the perception of activity and we may trial the same formula with two different perfumes. If women like the smell, the performance of the cream is perceived to be better.”

Dr Marion enjoys experimenting with formulations. It is not hair gel she is holding but a new oil-based face cleansing gel that she has helped to develop. She believes that in the future, skincare will deliver what she calls ‘local’ benefits. We already divide the face into different ‘zones’.

“I’d love to develop more products that would have different effects, depending on the part of the face they were applied to, depending on ‘local’ conditions.”

The Skincare Innovator: Philippe Touzan

Touzan is the head of Skincare and Suncare at L’Oréal Research & Innovation. He was born and studied in the Southwest of France, spending some time in Switzerland, where he discovered the cosmetic industry and first became excited by skincare science. He has been working in research and innovation at L’Oréal for 25 years now.

“Today, Touzan is the International Director of Skincare and Sun Protection. His role is to work with all the skincare brands across the company to develop effective products, drawing on L’Oréal’s enormous portfolio of ingredients, formulations and scientific know-how.

“The challenge for me and my team is to understand how consumer needs differ around the world, what consumers want from each of our brands and exactly how to invent new products that meet their needs. I am proud of what we do because we spend 100 per cent of our time on beauty, so we can call ourselves experts. My colleagues in research and innovation dedicate all their energies to developing patented molecules and we have specialists in every possible area – from biology and physics to statistics and psychology.”

For Touzan, the future is linked to the company’s strategy to win another billion consumers around the world.

“We have research centres on every continent and this is essential for us as we launch new products for new territories. The more we know about our consumers and their skin, the easier it is for us to develop the right products for them. So our forthcoming research centre in Mumbai is just the start of the future.”
Is it safe? Does it work? These are the two questions rightly posed by every consumer. Safety is addressed in a number of ways: through toxicology assessments of raw ingredients using alternative methods to animal testing; by predictive evaluation using reconstructed human skin models; and also by clinical trials. These are increasingly independent, double-blinded (that is neither the company nor the clinician knows which batch of cream contains active ingredients) trials, in which outcomes are rigorously assessed using objective physical measurement, often in addition to evaluation of biological markers through genetics and other technologies.

In April 2011, the company opened the L’Oréal Predictive Evaluation Centre at its site in Gerland, near Lyon. It brings together production of reconstructed models – now based here and producing 130,000 reconstructed skin and corneal units each year – together with the predictive side. This is a radical shift in approach: it represents a technological and scientific leap forward from carrying out tests on reconstructed skin to ‘virtual’ tests, based on computer modelling.

Predictive evaluation speeds up the development of new products enormously. Large numbers of potential active ingredients can be screened and only the most effective taken forward. In 2011 alone, the Gerland Centre evaluated over 1,000 products for safety (raw materials or formulae) and 100 ingredients for efficacy. Multiple models of reconstructed skin, typifying different ethnicities, allow for a much more targeted product development strategy and the centre is part of a global hub, linking L’Oréal Group’s integrated predictive safety evaluation of cosmetic ingredients and products.

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THE CONSUMER QUEST FOR HEALTHY & YOUTHFUL SKIN

But L’Oréal’s science is not just molecules and test tubes. The company also invests heavily in consumer research every year and has a network of 10 research centres around the world. To get closer to consumer needs, the company has also established 16 evaluation centres worldwide, which are dedicated to understanding the differing behaviour and beliefs of consumers across the globe.

At any one time, more than 500 research projects are taking place globally, as part of L’Oréal’s commitment to developing a scientific approach, in order to understand better the effect its products have on customers.

Laboratory Bathrooms

The past five years have seen L’Oréal set up mock bathrooms in its laboratories where it has filmed some 600 hours of men and women carrying out their beauty and grooming routines. The purpose has been to understand how people use products in their daily life and how to make these products work better.

Here is a quick snapshot of Mintel’s latest findings:

• While 81% of British women use a Cleanser (including make-up remover) for their daily facial skincare routine, 40% of them still use soap and water
• The most important group for cleansing usage is the 25-34 age group, at 90% penetration, followed by 88% of younger consumers (16 to 24 year-olds)
• Over a quarter (27%) of British women use Moisturisers with SPF on a daily basis
• Other important reasons for using skincare products: 37% to look better for their age, 36% for wrinkles and fine, 18% to get rid of dark circles and age spots, 13% to tighten skin
• 30% of women use skincare to provide a base for their make-up, with an uptick amongst over-65s (42%)
• When it comes to the type of skin, a third of consumers (33%) say Normal, 29% Combination, 16% Dry, 10% Sensitive, 9% Oily, 3% Acne-Prone

Source: Mintel’s Facial Skincare –UK- 2012 report

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THE FUTURE

WHAT DOES THE FUTURE HOLD? FROM GENOMIC STUDIES, L'ORÉAL ALREADY HAS SUBSTANTIAL INFORMATION ABOUT WHICH GENES ARE ACTIVE IN NORMAL YOUNG SKIN AND IN OLDER SKIN. NOW THE COMPANY IS TURNING ITS ATTENTION TO THE SO-CALLED GLYCOME AND LIPOIDOME. - AN ASSESSMENT OF ALL THE COMPLEX SUGARS AND ALL THE FATS PRODUCED WITHIN THE SKIN AT PARTICULAR TIMES AND UNDER PARTICULAR CONDITIONS. IT IS NOW KNOWN THAT GLYCOLYSE AND LIPOIDS, BY ATTACHING THEMSELVES TO PROTEINS, ALTER THEIR STRUCTURE AND FUNCTION. THERE IS ALREADY A STRONG SUSPICION THAT SOME OF THE SIGNS OF AGEING MAY BE INFLUENCED BY AGE-RELATED CHANGES IN THE GLYCOME AND LIPOIDOME.

SKIN-TEGRATION

In today’s global economy, skincare and beauty trends are passed around the world quickly. Traditional categories, such as skincare and make-up, are integrating to give birth to new ones. Take BB Creams for example, which originated in Korea, and are now the mainstream of beauty counters in Western Europe. Scientific innovation has made it possible for products to meet a demand for a growing diversity of skincare products, the whole range has been developed using the latest technology from L’Oréal’s labs and is designed, primarily, to be applied to the skin by trained skincare professionals. Scientists are in the process of testing new handheld computers, which will instantly assess a client’s skin condition while they are in a beauty spa or salon. Based on the complexion, pore condition, hydration levels and biological age of the skin, a reading, called a ‘Cell Score Identity’ will be given and the skincare professional will mix a tailor-made skin serum for his or her customer. These developments reflect decades of research by L’Oréal, which emphatically proves that no two people’s skin is the same.

PERSONALISATION

For the consumer, the future is personal. Increasingly, we will see not just personal consultations based on appearances at beauty counters, but true personalised skin care based on biological parameters. As the cost of sequencing the human genome continues to fall, it is not that difficult to envisage a scenario where a person either arrives with his or her own complete sequence on a memory stick so that the relevant parts can be ‘read’ and an appropriate suite of products recommended, or with some device into which a small sample of cells (say from a cheek swab) can be placed, in order to identify the presence or otherwise of a particular gene that will strongly influence what type of skincare the person should use in the future.

‘Couture skincare’ and serum blending. Kéraskin is a small but interesting brand to watch. Hailed as the new generation of skincare products, the whole range has been developed

DEVICES AND DESIRES

Philippe Barbarat is L’Oréal’s Global Vice President of Cosmetic Devices Research and he tells us that the future of cosmetics lies in technologically-advanced devices to apply products to the skin’s surface.

Dr Barbarat is a surprising addition to L’Oréal’s labs because he started out designing military missiles, rather than make-up materials for women.

“he carried out a straw poll of people who have bought an electric toothbrush and they all told us that they would never consider returning to a manual one. I am convinced that in the coming years we’ll see a similar phenomenon take place in the beauty industry,” he says.

“we spend a lot of time speaking with the end users and they always tell us that they would like the skincare products of the future to be even more effective than the ones that they use today. We have been carrying out a lot of research into how physical stimuli such as vibrations and light can do this and have found some very interesting results, which people will see hitting beauty counters in the coming years.”

The Group has just acquired a company called Pacific Bioscience Labs, based in Seattle, USA. PBL is the leader of the home skincare devices market due to the launch of very innovative Clarisonic skincare devices. Dr. Barbarat believes this is just the beginning of a new era of skincare routines where the device is going to take the cosmetic formula to the next level of performance.
‘EVEN IN SOMETHING AS PERSONAL AS THEIR SKINCARE REGIME, PEOPLE ARE MOVING AWAY FROM THE TWENTIETH CENTURY MODEL OF THINKING ONLY ABOUT THEMSELVES TO ENSURING THAT THEY ALSO PROTECT THE PLANET.’

LUCY BERESFORD, PSYCHOTHERAPIST

TREADING LIGHTLY

Like most other major companies today, L'Oréal is conscious of the footprint of its products. For example, the company now ensures it engineers its ingredients so that they repair healthy skin more effectively, and use as little energy and water and create as little waste as possible. This is called ‘green chemistry’, which, in its development, unveils new advances every year.

In skin science, green chemistry will play an even more fundamental role in the future. The development of green-inspired ingredients such as Pro-Xylane, and initiatives in biotechnology such as Smart Planting, are two significant examples of this.

SMART PLANTING

About 40 per cent of the active ingredients in L'Oréal products come from plants. Luckily, nine out of ten of these plants can be grown outside in fields, so do not need to be harvested from the wild. But there are still problems. For a start, individual levels of particular ingredients vary enormously from one plant to another. Then, the amount and potency of an ingredient in each plant can be adversely affected by weather conditions, like wind and heat. The quality of ingredients can also suffer as a result of an attack by pests, such as caterpillars and aphids, which may prompt the plant to produce bitter chemicals in defence. The plants may also need protecting from pests, which could mean having to use pesticides, and a number of species of plant need huge amounts of water to grow well. In short, there is potential for large areas of planting to be of no use, given the environmental factors at play. But, by using the latest advances in biotechnology, many pioneered by L'Oréal, plant stem cells can be exploited to become plant ‘factories’, turning out, time after time, stable, pure, active ingredients in systems that need minimal amounts of water and which never need pesticides.

HOW IT WORKS

At L’Oréal’s research centre in Tours, France, pieces of leaf are taken from a carefully selected plant, thoroughly decontaminated and placed in a culture medium. Soon, little clumps of cells are seen all at the edges of the leaf portions. These are de-differentiated cells which, given the right fluids to live in, will go on growing and growing, without ever forming a new plant but instead forming what’s called a callus, a lump of undifferentiated cells. You can see naturally formed calluses on every tree in autumn at the site where the leaf drops. These clumps can be put into different culture media which will prompt them to secrete different ingredients into the culture medium. Once they are put in liquid suspension, production can be ramped up to an industrial scale. The cell suspension is placed in a bioreactor where the cells grow exponentially over a period of several weeks, all the while producing the desired ingredient. The ingredient is then tested on L'Oréal’s reconstructed skin models to determine its regenerative capacity.

THE L’ORÉAL PARIS REVITALIFT LASER RENEW STORY

As innovation and new ways of testing product efficacy gather pace, product performance will be benchmarked against more invasive beauty treatments. The 30-year old L’Oréal Paris Revitalift range is the world’s most popular skincare product. It launched Revitalift Laser Renew, which was tested against a fractional CO₂ laser. The method was validated by AFSSAPS (The French Public Health Authority) and the results of this study will be presented at the EADV congress (European Association of Dermatology and Venereology).

Conducted on 50 women aged 45-55 with homogenous signs of ageing, one group of women had a fractional CO₂ laser session on crow’s feet. The other group used Revitalift Laser Renew, twice a day, for two months.

The test revealed that Revitalift Laser Renew resulted in an 18% improvement in micro-relief (skin roughness) and the fractional CO₂ session resulted in a 20% improvement. There was a 14% reduction in wrinkle depth with Laser Renew and a 17% decrease with the fractional CO₂ session.
For press enquiries or for further information, please contact L'Oréal Corporate Communications on +44 (0) 20 8762 4849 or comms@uk.loreal.com

L’ORÉAL
UK AND IRELAND