

## The Science of Beauty – part one

**Peter Brabazon:** “Good evening ladies and gentlemen. My name is Peter Brabazon. I’m the programme director of Discover Science & Engineering and we’re responsible for Science Week this week. It’s all about being surrounded by science and I think this evening we’ll see how the topic ‘Science of Beauty’ emphasises that even more.

“You’re very welcome to this beautiful building, the Royal College of Physicians, and the Corrigan Room. And just to let you know, Corrigan was the president here 350 years ago and this was a gentleman-only club, so what an interesting topic we have here tonight. Today we have fashion shows here and weddings, so times have changed. Not only are we in a very beautiful room, and I must say the restoration work they’ve done in the last few years is really excellent, beautiful, and that is, of course, exactly what the topic is tonight.

“While I appreciate that the emphasis tonight will be, a lot of the time, on cosmetics – cosmetics perhaps for women – don’t forget the men because they’re becoming much more conscious of their own looks as well. I think that’s probably driven by the women. Interestingly enough, in our own survey of the science in people’s lives and the technology in people’s lives, a lot of men said that they had hair straighteners. Quite a large proportion, in fact, of the sample group that we used, thirty per cent – it’s kind of hard to believe, but there you go, thirty per cent of men have hair straighteners.

“We’re very pleased, as Discover Science and Engineering, to be working with Women in Technology and Science. Sadhbh McCarthy and her colleagues here have really done well, and put this all together. Of course it’s a key thing from our perspective to talk about the opportunities in science and see – because we’re supported by such eminent scientists tonight – what the opportunities of scientists in the beauty industry are. But what we’re trying to emphasise is that there are careers and opportunities for young people and particularly, of course, for women.

“You’re fortunate tonight to have a very eminent journalist and broadcaster in Karen Coleman. Karen, interestingly enough, has worked in quite a lot of hostile environments so I’ll be listening to see how she keeps looking like that in those hostile environments. She firstly worked in all the former Yugoslav republics, and when you think of places like Kosovo, and broadcasting for the BBC, over a nine-year period, and she always looked good. So, I’ll be handing you over to her but just to remind you of course that she has a programme now on Newstalk called The Wide Angle

and it would be interesting to see if she mentions us in the future and mentions Science Week. Karen Coleman..."

**Karen Coleman:** "Thank you. Ladies and gentlemen, you're all very welcome to this very interesting session. I mean, it's been fascinating already talking to our three colleagues who are going to be taking part in this debate tonight and especially during this week's Science Week lecture series. First of all if I can extend my thanks to Sadhbh McCarthy and to Women in Technology and Science and to Discover Science & Engineering for inviting me to chair this debate. I'm delighted to be chairing it, both as a consumer of beauty products and a journalist.

"I was just thinking about an interesting little anecdote about beauty products because I never go anywhere without my lipstick, I always feel a bit naked. Even in war zones, it was the one piece of cosmetics I did bring around with me, glaring red lipstick, which was pretty horrendous sometimes to be looking at it. It's only afterwards, when I looked back at colour photographs of myself afterwards I thought, 'Oh my God, was I wearing that colour lipstick?'

"But I recently interviewed a very renowned Egyptian feminist called Dr Nawal Elsaadawi. She's come under a lot of trouble in Egypt for her very progressive, radical views on feminism. She's been booted out of Egypt because she's condemned the Islamics' treatment of women and she's moved to the US. I thought it would be very interesting to get this woman's views on the veil and the wearing of the veil in Islamic cultures because, as you know, a lot of people would say it's a symbol of repression, while perhaps Islamic women who wear the veil say 'No, no, no, it's not.'

So, we were having this discussion and I was asking for her views. She turned to me and she said, 'You're wearing a veil.' 'Am I?' 'Yes,' she said 'and you're as suppressed as the women who wear veils in Islamic cultures in my view.' And I said, 'What veil am I wearing?' And she said, 'You're wearing lipstick.' And she then went on to say that any woman who wears lipstick or cosmetics of any kind are wearing veils and that we should all be going around completely naked in terms of no cosmetics. And I was just thinking as I was coming in here tonight, can you imagine if all the women in the world who wear make-up decided to take her advice, and how the people producing the cosmetics would be very troubled by that?

"We do hear a lot about beauty products and I suppose to what extent – and hopefully this will be an area we touch on tonight – the claims made by those who produce these beauty products, to what extent are they true? Claims like 'Anti-aging creams will reduce your wrinkles,' or products that will increase your beauty. And then, of course, there's a lot of scaremongering as well,

perhaps some justified, about beauty products. We're worried that, because they carry chemicals, they might not be good for our health, worried that they might be penetrating our skin. There are even scares about could they possibly cause cancer. So I think the topic tonight is a really legitimate one to ask, to question, and I am really delighted to say that we have three fantastic panellists who will each be giving a presentation of about 12 to 14 minutes and then it will be followed by a question and answers session. So please, if there are any questions, do bear them in mind and I will try to get your questions in.

"Now, we have, taking part in the debate tonight, Vanessa Hyde who is a Quality Assurance Manager with Shandon Clinical Trials; Dr Raniero de Stasio, Scientific Director with L'Oréal UK and Ireland; and Dr Chris Gummer, an independent consultant to the cosmetics industry.

"Dr Gummer will be starting first. He has worked for more than twenty years with Proctor and Gamble in research and development. He has extensive experience in copy claim and development and claim substantiation with some of the world's leading consumer brands. His experience ranges from fundamental research, hands-on development of data and methods through a copy development and product prudence – new word for me but there you go. But importantly, Chris has extensive experience in working with BACC and the ASA from the position of advertising a product. He is also a widely published and quoted author. So Dr Chris Gummer, perhaps you could take the floor first. Thank you very much."

**Chris Gummer:** "Thank you very much for the invitation to speak here this evening, it really is a pleasure to be here. Can we have the video please?"

**Video:** "[Unclear]...so I invest in my skin. I'm always searching for my perfect moisturiser. I've discovered Derma Genesis. All new L'Oréal Paris Derma Genesis has pro-xylane and hydroxyl acid. Everybody's talking about it. It intensely moisturises for younger looking skin and nurtures cells in the top skin layers. Skin feels plumped up, tightened, with a dewy glow. New L'Oréal Paris Derma Genesis. For your free sample visit [lorealdermagenesis.co.uk](http://lorealdermagenesis.co.uk). Because we're worth it."

**Gummer:** "Well, we are talking about the science behind beauty. That's how you see beauty come into your households almost every day, whether it's in magazines or on TV. These are some of the typical examples that you might see in a magazine for anti-ageing or a change in the appearance of wrinkles. In this day and age, there is a lot of scepticism. Have they been Photoshopped? Has there been airbrushing? You can see, especially in the pictures on the right,

a big difference between the before and after. They look quite striking but can you really trust them? Well, the answer is yes. And what I want to do is tell you a little bit about the science that goes behind the beauty care industry, and a little bit about my science and why I've enjoyed so much being in this industry.

"What we've done here is take a couple of the wrinkles before and after and what we've done is use very sophisticated computer analysis. We take an image of the skin surface, it's not a photograph as such. We project a little fringe onto the surface of very fine lines and look at the distortion in those lines, use a computer program, turn them back into an image, and then measure the difference. What you can see in these images, the one on the left, the wrinkle has a lot of red in it which points to being very deep and blue equates to being very shallow. And after treatment here of eight weeks, you can see that the red is gone almost and the blue is increasing. So even in the pictures before, even if you didn't trust the pictures, if you said, 'Well, somebody's adapted the pictures a little bit', we can actually prove, through some of the most sophisticated image analysis – the same sort of stuff that's used to look at the far planets of the solar system – that the wrinkles have actually changed in depth.

"It's often said that beauty products are more myth than science. If that was the case, this would be one of the great stories for the journalists. This would be the biggest collusion of people on the planet. Because every day, I get to work with people from all different disciplines; biologists, chemists, material scientists, fluid technologists, you name it. Even to people in genomics, I couldn't think of a genomicist. But we're right at the edge of science and you may have seen on the BBC news the other day that the genetic code for the bug that causes dandruff on your scalp has now been understood and unravelled. We're getting right to the edge of science.

"So today's beauty products really are built out of the most outstanding applied science that's available and by some of the most outstanding scientists on the planet. Men and women across the world are really stretching their science into these products.

"When I started to put this brief talk together, I looked back over my career and thought 'Where have I worked and who have I worked with?' And I suddenly realised that I've worked with people all across the globe. And I don't know if you've ever been to an interview, when you were much younger, and they say to you 'Well, what do you want to do?' And I said, 'I want to get promoted and I want to travel the world.' And as I look back, I've been very lucky because I've achieved both of those. The most important one was to travel the world and work with some of the best scientists available.

"Just to take a couple of these pictures – the top left is Besançon in France, one of the old cities, superb dermatologist working on hair there. Over to the far right, one of the other old cities, Aachen in Germany, one of the premier fibre science labs in the world working on hair there. And working in California, working on drug development and penetration of ingredients into the skin. And they're working with dermatologists out in Sydney and Melbourne. If any scientist wants to come into this industry, there's a place which is full of science and full of opportunities.

"And I thought I'd just put together this map, because it amused me. This gave me an idea of how far we've gone across the world with the sole aim of bringing back the science from people that don't necessarily work in the beauty care industry. From people who are maybe petrochemical experts, they're experts in free radicals in the oil industry but what we wanted was their expertise in chemistry to solve some of our problems in the beauty industry. So we've been everywhere and we've talked to everybody so that's the nature of the science in these products.

"So, isn't it just stick it all in a pot and stir it up? Is it really that simple? Well, I won't go through all of these but this is just a very brief list of some of the techniques that are used every day. And this is not just techniques, some of them unpronounceable: time of flight secondary ion mass spectrometry, TOF-SIMS for short; viscoelastometry; electron microtic infra red spectroscopy. I work with them every day. The interesting thing is that you will see all of these techniques every day. These are the things that go behind what you might just think is a simple pot of cream. Really sophisticated science, right at the edge of science as well.

"What do some of these things look like? Top left is a TOF-SIMS machine, costs about a million euros. Sometimes you have to have one just to do the job. The one next to it, top middle, is a corneometer. That's how we measure the moisture content of the skin and it only costs us €1,000 but it's a really important instrument. That one, bottom left corner, looks like a coffee machine but it's actually a rayometer. That tells us all about the way the product behaves on your skin; how it slips and how it sheers and if it sticks and whether it smoothes. So we really need all of these things.

"Then we push the science really out to its edge with computational molecular modelling. Instead of going to find the molecules, we make them up in the computer. We think 'What if?', 'I wonder how?', 'Suppose we put this on a molecule...' and we ask the computer a whole load of questions, 'Would it spread on the skin?', 'Would it penetrate?', 'Is it safe?' And most of the molecules we

look at these days, we actually generate in the computer and they actually never see the light of day because they just won't do quite what we want them to do.

"So why is it all so complicated? Well, that's the ingredient list of one of the world's leading creams. I won't say which one, you can go and find all the different ones in the chemist and work out which one it is. But you can imagine trying to mix all these things together, and I always liken this to a soufflé. A soufflé is very few ingredients, very difficult to make. My son, at seventeen, can make the most brilliant soufflés; I can't in the same kitchen. There's something special about what he does, same ingredients. When you add all of these ingredients together, a lot of them don't like each other. Some are solid. Some are liquid. It's just trying to put them all together at the same time. And then sometimes when you take a solid which you need another liquid to disperse they then don't like a third one so you need another ingredient. Each of these ingredients has very special properties to either put the product together or make it feel a certain way or deliver a certain ingredient to you.

"And the little picture down the bottom is just looking into one of these products. The little pearls you see there are actually liquid crystals. Now liquid crystals are a little bit like solid crystals that you would see in a diamond or a sapphire on your ring, but these are actually made of liquid. And we need the structure and the chemistry to hold them together. They're layer upon layer of different liquids to form these wonderful crystals and they deliver ingredients in special ways.

**Gummer:** "What I'd like to say about my product is something like this: 'Makes yourself younger. Makes you richer.' Wouldn't it be wonderful if I could say all of that? Well, the answer is I can't. Because it doesn't matter what I say, because it matters to you, it matters to the regulators, it matters to the competitors. To you it matters because if I say the wrong things and you don't believe me, I've lost your trust and you'll never buy the product again. I can't over-claim. It won't make you thirty years younger, that's for sure.

"The regulators keep a very strong eye on what we do. And the competitors know the science just as well as each other so if you over-claim in one particular area, your competitors will tell you you're over-claiming and go straight to the regulators. So everybody's watching each other and there's very powerful rules out there. And one of them is the BACC. The same thing happens over here. I do some consulting for the BACC. All TV and radio copy, advertising, is pre-cleared before it goes on air. That means the script is sent in, they make sure it follows all the advertising code and then any claims that are in there, any data that's in there, is sent out to a group of consultants to make sure it's actually right. And this dialogue goes on between them until the claim is accepted

and proved properly. So everything you see on TV, everything you hear on the radio, has been pre-agreed by people to make sure it's absolutely honest.

"Now, in the rare occasion that things go wrong, that something slips out, there's another group out there called the ASA, the Advertising Standards Authority. You may be aware that Ryanair have gotten into a lot of trouble with these people. The Advertising Standards Authority, curiously, on their site say, 'Welcome to the Advertising Standards Authority.' You don't want to be anywhere near them. If you're there you're in trouble generally. But it's another regulator that's keeping an eye on you. And by and large, although it hits the news and they publish everything, by and large the cosmetic industry does not get into trouble with the Advertising Standards. They see a tiny, tiny number of complaints and the number of complaints upheld is extremely small. It's only a few tens over a whole year.

"So, if only you knew some of the science that went on behind the beauty... If there's a budding scientist out there I'd say 'Get into the beauty industry. It's a fabulous place to be.' There are a whole range of very talented scientists, they're not in it because it's the beauty industry, they're in it because of the quality of the science that's done. They're in it because of the problems they're trying to solve, which are right at the edge of science and are really, really challenging. They like coming up with solutions. And their solutions in their minds are fantastic in their science, but what their solutions really do is bring products to you, bringing the science of beauty into your homes. Thank you."