

The Science of Feelings and Emotions

Summary from the U3A Handbook for 2010:

Feelings are a commentary we make about our biological emotions. In life experience, feelings are what matter most. Neuroscience is teeming with new discoveries about our emotions. We will explore these in a participatory course that is designed to be fun and requires no previous specialised knowledge.

Session 1 – February 3

1. List feelings and emotions – difference between them? - moods
 - Good or bad - positive or negative?
 - Your favourite feelings – your very worst feelings
 - Your most common and least common feelings
 - Your Jen ratio
2. What emotions do (in terms of our experience) – why are they important?
 - Scientific explanations from physiology, psychology, sociology - philosophy
 - Evolutionary significance of various emotions
 - Social purpose and value of certain emotions
 - Problems associated with particular emotions
3. How we recognise emotions in one another
 - Emoticons – facial expression

Introduction

Feeling and emotions are with us constantly – we live with them at every moment. They are the most obvious elements of our experience of living – of being alive. At any moment, if someone says: how are you feeling – or you ask yourself: how am I feeling – you might not always be able to put it exactly into words, but you can't really deny you are feeling something. We are deeply aware of being sentient creatures– living beings that have feelings. A famous Australian biologist, Charles Birch, whom I admired greatly – who, incidentally, died in Sydney just a few days before Christmas – always liked to say: feelings are what matter most. They are not just the most obvious – they are also the most important elements of our lived experience because they give our lives value and meaning.

Now you might be saying: what about thoughts? I think thoughts are the most important aspect of my experience. If I didn't have thoughts, I wouldn't even know I was alive – and that's quite true. But, if you've been doing my previous course, which was called Mind-Body Science, or reading recent books, you will have a pretty good idea that feelings are an older and more fundamental attribute of our mind - and thoughts actually arise from the biological substrate of our feelings. We

learn to think – babies learn to think - from the emotional interplay with their mother and the interwoven, languaging-emotioning, stream that follows. If that idea is new to you – or seems strange – don't worry about it now. It will become clearer as we look into our feelings more closely.

Of course, thoughts can trigger feelings, too, so it's a circular process. But, at a deeper level, what we call reason – the rational part of our mind – is based upon an internal physiological framework of our emotions. One way this was discovered was to observe people whose brains were damaged such that most things still worked normally, except that they couldn't feel properly. When the capacity for feeling is damaged, people become gradually more irrational and sometimes very destructive and dangerous. The most famous example of that, which is written up in many books, is the case of Phineas Gage.

In 1848, he was working building the railroad in Vermont, in the USA, when a steel rod he was using to tamp explosives was blown right through his face, through the front part of his brain and out the top of his head. He recovered remarkably well and seemed to be quite normal at first, but then it became apparent that his judgment was affected. He could decide what to do quite rationally, but he no longer cared about or noticed the consequences, or the outcome, of what he was doing. The doctor said he lost all 'deference of his fellows and was impatient of restraint or advice when it conflicted with his desires' - sounds like some spoilt brats I know - and he took to swearing all the time, which he'd never done before. He'd been a normal and considerate man before the accident, apparently.

What had happened – and there are many other examples of this sort of thing - was his orbitofrontal cortex had been damaged, which has absolutely no effect on language, memory or sensory processing, but which ruined his sense of what he was feeling and what others were feeling. We'll explore all this later, but this part of the brain and its links to a central part of the brain called the amygdala, play a very important part in the processing of feelings - and without feelings we simply don't know how to relate to others and operate in the world.

So feelings are real and feelings are important, but the scientific study of what they are, what causes them and what effects they have has been very much neglected – until now. In the great wave of scientific progress of the last century, with all the new theory that was created in psychology, very little was written about the emotions per se. There was a lot about complexes and reflexes and conditioning and, more recently, mood-changing chemicals to manipulate feelings, but the basic causes and purposes of our feelings were largely ignored.

In the last few years – only the last decade really - this has all changed. Both science and psychology are getting right into them now, in a big way, which is why I'm excited about putting on this course. There is new stuff coming out every week, it seems. So I'll be learning about it as we do it. I don't have it all prepared beforehand as in my previous course. It might be a little less organised, but at least it'll be hot off the press, which is more exciting in a way – than being too organised. I do have an overall plan for the course and an idea for choosing which emotions we'll explore, which I'll tell you about in a minute.

There are some historical roots, of course. In the late 1800's – well over a century ago – one of my favourite writers on psychology, William James, had written up some very interesting thoughts and studies of emotions, which we will look into a bit later. He also wrote *Varieties of Religious Experience*, amongst other things. But then psychology began to focus on behaviourism and conditioning and memory – James went right out of favour - and, for most of the twentieth century, the emotions were not thought to be important topics for psychological research.

I should say that this course is not a psychology course, strictly speaking, and I'm not a psychologist. I'm a retired scientist who specialised in animal physiology, which is about the nervous system and the chemical processes within the body that make various things happen and affect our behaviour. My particular field was the measurement of hormones in the blood of animals and humans and my PhD was on certain hormones that are released from the brain itself and affect our cognition – that is our mind – so it overlaps with psychology, but it's not the same thing.

So, scientific discussion about emotions has only recently come back into favour. Long before William James, some philosophers in the eighteenth century – David Hume and Adam Smith, in particular – were very interested in the emotions. Adam Smith wrote *The Theory of Moral Sentiments*

before he wrote his *Wealth of Nations* so he could be regarded as the founder of, not only the so-called dismal science – economics – but the sentimental science as well. The scientific revolution followed and science was too busy discovering all sorts of wonderful physical and material things which appealed to the rational mind. In the latter part of the nineteenth century – as well as William James - there was a very famous biologist, Charles Darwin, who thought emotions were important and I'll have more to say about his work shortly. But, generally, the emotions were relegated, not just because they were difficult to study, but because they were actually seen as a problem. And this is an idea that still persists quite strongly today.

It was supposedly Plato who first said that emotions arose from a lower part of our brain and they perverted reason. In other words, they get in the way of thinking clearly. They were a corrupting influence on our mind. You hear it said that life would be easier if we weren't at the mercy of our feelings, which often come up uninvited and make us say something we didn't really mean or absolutely crave for things we would be much better off without or even shy away from something that would be very beneficial for us. You also hear people say: don't get emotional about it; look at it logically, like I am – men do this more than women, I must admit! Or, we say: I might not make the best decision if I allow my emotion to come into it. This way of thinking is a product of the culture in which we live. Given that emotions are actually the most important part of the human mind, according to modern biological science, we'll have to look at this more closely.

It's a practical real-world issue, but the problem lies in a more philosophical domain, in the distinction we make between objectivity and subjectivity. And this is also the reason that science could not get involved in feelings for such a long time. Science was designed to work with objectivity where there is no personal involvement – processes and mechanisms are studied quite independently of whether anybody has any feelings about it. Personal feelings would get in the way of an objective scientific explanation. And this scientific method works well for lots of different subjects, particularly machines, but also rocks or plants or stars and the universe – even parts of the brain (as long as you can distance the brain in your hand from your personal experience of having a brain), but it strikes a problem when you want to study feelings, which are interpreted subjectively – that is by each individual separately and personally.

Nowadays, science is privileged as the most reliable and certain way of accessing truth, and, in the same way, rationality generally is privileged as a more trustworthy explanation than simply relying on one person's impression or opinion – especially if that description is loaded with emotive terms such as: it was, like, huge and incredible and made me feel small or someone might say: it's just so beautiful – which is a statement of the aesthetic value of an experience – not an objective explanation. Objective explanation has the big advantage that it can be agreed upon by many people, which makes it easier for us to communicate and work together.

But when neuroscience revealed more about how our brain works, it was realised that everything we perceive and know is personal and can't really be proved to exist independently of our observing it. That's just a convenience we have become used to, which was useful in some ways, but was blocking the study of feelings and human experience. The observer effect is always there and is now acknowledged. We don't see or hear or know exactly or completely what is there because everyone's mind is selective and selects what it sees and hears according to the organising ideas it already has formed. And this has an emotional basis. So neuroscience had to include the emotions and find better ways to measure the individual changes within the brain and body.

It also began to acknowledge that there is an inner world that is not simply a reaction to what happens in the outer world. Some of our feelings come from direct sensory experience, but many arise and change within our bodies according to much more subtle connections we make with the world and according to our imagination, which can be quite unrelated to what is happening outside us.

So the distinction between objectivity and subjectivity is not like it used to be. You can think of objectivity as relating to the methodology science uses, but it's not the privileged, certain, truth it used to be. And subjectivity is understood differently as a personal description, rather than an inferior description. I'd like to talk more about our inner and outer worlds and the Process Philosophy of Alfred North Whitehead another day, if we can fit it in.

To sum up, there are two reasons we can do the science of feelings today? One is that a lot of chemicals and other activities in the brain and body can be measured today that could not be measured even a few years ago. Secondly - I will go into this more in later sessions - the key reason is what I said right at the beginning - the science of human experience is not the same as the science of mechanisms and machines. It's a new type of science. Recognising the organic and holistic nature of living systems – their self-organising characteristics – has made it possible to understand the emotional part of the mind and what it does more clearly.

What are we going to do?

So, this is what I'm proposing we do to make it enjoyable to learn something new - and to share what we already know - about our feelings and our emotions. Firstly, we'll start making a list - or several lists - of feelings and emotions - those you might consider positive or good, those you might consider to be negative or bad – and I would like this list to come from your suggestions. I will add to it from other lists I have here if necessary. It might take several sessions to get a complete list of the feelings you and I are most interested in learning more about. There's a lot of them, but we will be able to aggregate some of them into groups.

Now, the important thing is: I want you to come up with the feelings you would most like to talk about in this course. In fact, taking that a little further, I'm suggesting that each of us could pick out one or two particular feelings that we think of as our favourites – the ones we like the best. And also pick out one or two that we particularly dislike – the worst ones, that we would most like to avoid, if possible – even though we might want to learn about them in this course. Now, this might sound quite trivial, but I'm going to suggest that the ones we like best or least at the start of this course might not be the ones we like best and least at the end of the course. I'm not sure if that will happen, but let's be open to the possibility, anyway, that our ideas might change about the value or the desirability of various feelings as we explore them more deeply. I think that will be an interesting way of looking at it.

In studying the physiology of emotions, I've come to love and respect them in a funny kind of way. You learn about yourself through them. Sometimes people say, but the problem with emotions is their timing – they come at the wrong time – which they do. But they all have value and purpose for our communication and our whole being. We'll look at how some are obvious evolutionary adaptations. They are also social constructions we learn through our complex social lives. Some seem to cause problems. But the thing to remember, I think, is this: they are not just forces and processes that control us or dictate what we must do. We also influence them and, by our actions and our thoughts - we shape their process as well. They are a very crucial and precious part of who we are and how we live.

What is the difference between an emotion and a feeling? This is not something to worry about or get too pedantic about at this stage, but it will become quite important as we progress through this course. As you identify your own experiences, it doesn't matter whether you call them feelings or emotions. From a scientific point of view, however, there is a reason for making this distinction between the two. It's because of the difference between our outer world and our inner world. What we express out here – what we hear one another say - is always framed in language. That's why I said in the Program notes that feelings are a commentary we make about our biological emotions. To a physiologist, the emotion is an internal process involving nerves and hormones and intercellular networks. And the feeling we report does not necessarily correspond to the emotion. We sometimes say we feel happy when the internal chemistry is actually sad – and so on. So, as we explore the science, we will need to differentiate or distinguish feelings from emotions.

ACTIVITY 1

To make our list on the board here, I suggest we work in small groups first. So, work out who is in your group and then it would be nice to introduce yourself to the other members and then discuss what you think are the feelings we should study in this course. Think about your particular favourites and your worst ones – share this, if you want to. I'll come around to each group.. When it's time to

stop talking and come back to the lecture format I will ring this tingshaw, which has a distinctive sound.

Post-ACTIVITY

I will write up all your suggestions on the board. As we do this, I want to give a bit more background about the amazing variety of our feelings and how we recognise them.

The Variety of Feelings

People feel happy, sad, glad, mad, sick, well, poorly, fine, over the moon, down in the dumps and just about every other word or phrase in our language. The variety of expressed feelings is limited only by the imagination and vocabulary of the person who is having the feeling. It isn't important that we list every possible variation because there are some key words in our language that are so commonly used to describe a particular feeling that they will serve as useful labels to use in our discussion. Whether the feeling that you call 'depressed' or 'elated' is the same feeling that I give to that label is another matter.

The main reason that feelings are important in our lives is that we are an extremely social species. There are many other social animals, but we are born with our brain less developed than any other species so we rely on interpersonal communication from the very beginning to develop our human manner of thinking and then almost all of us build our entire lives around relationships with other humans. So much so that neuroscientists nowadays refer to ours as a 'social brain' in which the complex patterns of connectedness that we call neural nets are constructed almost entirely through interaction with other humans. We have 'mirror neurons' that copy what is happening in one another's brain and special 'spindle cells' that tell us instantly how close we want to be in that moment with another person or whether we need to back off a bit.

It will be no surprise, then, to learn that our brains devote a very large part of their cellular energy and activity to recognising and identifying what another person is feeling or rather what emotion they are experiencing. We are all far better at this than we realise, although some people make a very specialised art of doing it. I've been told that some proprietors in jewellery shops will watch their customer's eyes very closely because you or I can't stop our pupils from enlarging whenever we see something that really takes our fancy. We don't want to let on, but he knows that expensive one really attracts us. Real estate agents are trained to detect the signs of barely controlled enthusiasm when a client feels that a certain house could be just right for her and her family. They know this will be a major factor in the decision to buy that house even though it may be cloaked in lots of talk about the resale value and the good location.

You can often tell how a person is feeling by watching how they stand or walk. You can probably tell I was a little nervous at the start of this session, particularly from my voice. It's my biggest giveaway. There is good evidence that humans, as well as animals, can actually smell fear in one another when that sense has been finely tuned. But in the business of recognising feelings, it nearly all happens in the face. Our brains specialise in detecting the most subtle changes in facial expression. Even looking at clouds or trees, a little voice can be saying: where's the face?

So the feelings that will probably be most important to us will be those we detect in one another's faces. That's why I gave out that sheet of caricatured facial expressions earlier. It's a very serious scientific business – facial expression. We'll look into it much more. There are 43 different sets of muscles in the human face and I expect you to learn how to control every single one of them by the end of the course. No, not really! Some are very difficult to control, but they do reveal your emotions.

But we don't want to forget those deeper inner feelings such as awe and wonder or the pure aesthetic pleasure you might experience when you look at some of the paintings in the Masters exhibition in the National Gallery in Canberra at the present time or watch a sunset from a lookout in the Blue Mountains or on the plains in Central Australia? And feelings of hope or longing, which might be very strong, but don't show quite so obviously on the face.

Here are some lists of emotions from various authors for you to consider. The first, by Charles Darwin, was probably the first detailed account of what emotions look like, in a scientific sense,

although poets and philosophers had been describing them ever since the human species began. The three other lists below come from recent popular books on the subject. They reflect the author's personal interests and are not meant to be complete lists. How many of these emotions are also your personal interests for this course?

Darwin's list

NEGATIVE (26) Anger Anxiety Confusion Contempt Disagreement Disgust Embarrassment Fear Grief Guilt Horror Indignance/Defiance Ill Temper Negation Obstinateness Pain Perplexed Rage Resignation Sadness Sneer/Snarl Shame Sulky Terror Weakness/Impotence Apology	POSITIVE (16) Admiration Affirmation Astonishment Contemplation Determination Devotion/Reverence Happiness High Spirits/Cheerfulness Joy Laughter Love Maternal Love Pride Romantic Love Surprise Tenderness/Sympathy JEN = 0.6	<p>Claudia Hammond's list:</p> <p><i>(the ones she wanted to write about)</i></p> <p>Anger, disgust, fear, guilt, hope, jealousy, joy, love and sadness (9)</p> <p>(JEN = 0.5)</p> <p>Paul Ekman - the basic emotions</p> <p>Anger, disgust, fear, sadness, surprise and happiness (6)</p> <p>(JEN = 0.5)</p> <p>Dacher Keltner's list:</p> <p><i>(the one's he mostly wanted to research):</i></p> <p>Awe, compassion, embarrassment, laughter, love, smiling and teasing (7)</p> <p>(JEN = 2.5)</p>
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When Darwin's book, *The Expression of the Emotions in Man and Animals*, came out in 1872, it was a best seller for a few months, but then sales declined and the book fell into obscurity until modern emotion researchers brought it back to prominence. Darwin was an incredibly careful observer of everything in nature and he studied his children and family and other people just as closely as he studied animals and plants. And what he noticed was the evolutionary continuity between animals and humans. This was, of course, part of his great theory of evolution that has influenced biology so much over the years. In this course, we don't need to go into theories of evolution. It'll be more fun to look at our feelings, I assure you. I have worked with many different animals and humans and it seems to me that what we call human emotions are also expressed in animals, albeit in a more rudimentary way – to our eyes, anyway. We might look at some examples of that later.

You will notice that Darwin had considerably more negative emotions than positive. This is often the case when people produce lists of their emotions. Is it that we are more likely to think of the bad ones or are there, in fact, more bad ones in everybody's life experience? This is something we will have to consider as we go along -something you might like to think about.

There is a relatively new field of psychology, which I think is good for our course, called Positive Psychology. Any of you who have done Janice Poulson's course on the Art and Science of Happiness will know all about that. People like Martin Seligman and Jonathan Haidt (whose book I have here)

are leaders in this field. Also Dacher Keltner who proposed the idea of a JEN ratio which I thought we would use in this course. The term, JEN, comes from Confucius, apparently and refers to the good character and feelings that come from 'bringing the good in others to completion' – which is a beautiful idea I think. It's a really nice motto to have: bringing the good in others to completion, rather than bringing the bad in others to completion – which we sometimes do unwittingly.

Essentially, JEN is the ratio of good and bad feelings in your life. Darwin has 16 positive divided by 26 negative emotions which is a JEN of roughly 0.6. Four of Ekman's basic emotions are bad and 2 are good, so 2 over 4 gives a JEN of 0.5. We'll have a look at more examples later. A JEN of 1 means you have just as many good feelings in your life as bad ones. Anything less than 1 means the bad outnumber the good.

And, over the next few sessions of the course, I'd like to give you the opportunity to work out your own JEN scores and then see if they change at all by the end of the year. Some emotions might be good in one way, but bad in another, so we won't take it all too seriously – it's just meant to be a bit of fun.

Finally, today, before we go back to our lists, I want to mention emoticons. I'll bet some of you are good at drawing smileys and funny faces. As we go through different emotions, please share those skills with the rest of us – because they're such a neat way of capturing the essential details of facial expression, which we will talk much more about in the next session.

ACTIVITY 2

To prepare for this, this is one more activity to do in your groups – if you want to.

Each group should have a set of nine emoticons – numbered 1 to 9. Can you match them with the nine emotions that Claudia Hammond refers to in her book?

Hope	9.	1.	
Anger	8.	2.	
Love	7.	3.	
Jealousy	6.	4.	
Fear	5.	5.	
Anger	4.	6.	
Disgust	3.	7.	
Sadness	2.	8.	
Joy	1.	9.	

And don't forget your homework; there are 43 sets of facial muscles to practice every day!

