Articles

Spotlight



ISRE

Conferences

Editor's Column

Interviews

Home



There is much to enjoy in this issue! Click on the post title to get a quick overview of what's inside.

Sander on ISRE 2015



David Sander, Program chair of ISRE 2015, introduces the next ISRE conference, which will take place in Geneva, Switzerland, July 8-10 2015.

ISRE Matters



Check out Arvid Kappas' latest column. ISRE's President discusses the current golden age in emotion theory, and calls for volunteers for an exciting new opportunity.

HOW DOES MUSIC ELICIT EMOTIONS?

Contact



In this issue of the Emotion Researcher, psychologists, neuroscientists, ethnomusicologists and philosophers share their influential views on the nature of musical emotions.

An Interview With Lisa Feldman Barrett



Read an interview with Lisa Feldman Barrett, one of the world's leading affective scientists. Lisa reminisces about her challenging upbringing in Toronto, Canada, and presents her latest views on emotions as situated conceptualizations, on what we have learned about the emotional brain, and on the effects of aging on emotions.

Young Researcher Spotlight



Maggie Tukumba, one of the few living speakers of the Australian tribal language of Dalabon, tells an ancestral story to Maïa Ponsonnet, the recipient of this issue's Young Researcher Spotlight emotionresearcher.com

Editor's Column

Andrea Scarantino, Department of Philosophy and Neuroscience Institute, Georgia State University

Have you ever found yourself moved while listening to Albinoni's *Adagio*, with its heartrending trumpeting sequence? How about irresistibly pulled to the dance floor by James Brown's *Sex Machine*? Do you get cheerful when listening to Benny Goodman's *Minnie's in the money*? Does the musical theme from *Jaws*, a movie that has forever ruined swimming in open waters for many of us, make you afraid? If you answered "yes" to any of these queries, this issue of *Emotion Researcher* is for you.

The central question before us is to understand why and how music elicits emotions. This is an especially challenging question, because many of the default explanatory

strategies we put to work to make sense of emotions appear distinctively inadequate when applied to musical emotions.

For example, we tend to think that emotions are elicited by appraisals that register how stimuli impact our goals, but what exactly are the goals impacted by music? Is the appraisal system being by-passed by musical stimuli, or do musical stimuli elicit a special type of appraisal?

We also tend to think of emotions as having biological and social functions. But what exactly is the biological function of getting sad or cheerful when listening to a certain pattern of notes?

Should we think of musical emotions as useless vestiges like the appendix? Or are they rather an expression of our ability to detect ecologically meaningful patterns in sounds, and adjust our behaviors accordingly, as an animal does when hearing the sounds of a familiar predator? Or is perhaps their primary function social, and to be understood in the context of communal experiences of music consumption?

It is also far from clear what makes music, especially instrumental music, capable of generating a specific emotion rather than another. Why do we get sad rather than happy when we hear Albinoni's Adagio? And what exactly is it about Benny Goodman's *Minnie's in the money* that makes us cheerful? Whose emotions are being expressed anyway? Are they the emotions of the musicians? Or those of the music's author? Or perhaps those of an imaginary person we concoct in our heads while listening?

These are some of the questions that four eminent experts on emotions and music will tackle in this issue. We begin with psychologist Patrik Juslin, who has developed what is arguably the most careful and systematic analysis of how music impacts emotions to date. Juslin argues that there is no unique mechanism through which music impacts emotions, but rather a roster of mechanisms with different evolutionary origins that are served by different brain circuits. An implication of Juslin's analysis is that, since several of the eliciting mechanisms are not consciously available to the emoting subject, we cannot simply rely on self-report methods for the study of appraisal of musical stimuli.

Judith Becker, an ethnomusicologist, takes us away from the lab and into the field, emphasizing the communal dimension of our experience of music across cultures, and the role of physical engagement and emotional contagion in shaping the way we react to music emotionally. Her primary recommendation to students of musical emotions is to pay attention to the interactive aspects of musical experience, which are in danger of being neglected when we present isolated experimental subjects with recorded sounds detached from their public context of production.



Philosopher Jenefer Robinson gives us a detailed overview of the main live issues in the philosophy of music and emotions, exploring whether emotion plays a role in musical understanding, how music expresses and arouses emotions, and whether the expression and/or arousal of emotions is important to the aesthetic value of music. Her core proposal is that the most convincing explanation of the powerful grip music has on us is that we imagine the emotions being expressed by music as being the emotions of an imaginary "persona" to which we can emotionally relate.

Neuroscientist Patrik Vuillermier, finally, provides us with an overview of what we have learned about how the brain responds to emotions. He suggests that peaks of pleasure experienced while listening to music correlate with release of dopamine in ventral regions of the striatum, and increased activity in both striatum and insula, accompanied by transient reductions in activity in amygdala, anterior hippocampus, and ventromedial prefrontal cortex. Vuillermier also explores whether the emotions elicited by music are better understood on a dimensional or a basic emotion framework, and whether our understanding of how the brain implements musical emotions can be used for therapeutic purposes.

The Young Researcher Spotlight is on linguist Maïa Ponsonnet, who studies aboriginal languages in Australia, with special focus on Dalabon, an endangered language currently spoken by about a dozen people in the world. Ponsonnet has lived in the Dalabon community for extended periods of time, investigating emotion vocabulary, metaphors, intonation and other prosodic features of the Dalabon language. Check out her discoveries on the somewhat peculiar ways in which Dalabon speakers communicate their emotions.

ISRE's President Arvid Kappas takes us on a journey through different epochs of emotion research, wondering whether the current golden age of emotion research is here to stay. On a more practical side, in his column Kappas outlines the rationale for having a new forum of online discussion for ISRE members, and calls for nominations for the role of ISRE Forum Host.

We also have a guest column from David Sander, program chair and organizer extraordinaire for ISRE 2015. Check out his column to figure out what the program committee is looking for, and who the three keynote speakers are (You will be pleased!).

Last but not least, this issue of Emotion Researcher features a wide-ranging interview with Lisa Feldman Barrett, one of the leading affective scientists in the world, who generously shared anecdotes of her life, pictures, recipes (check out her challah bread!), advice for young researchers on how to get grants and, most importantly, a detailed discussion of the origin and current prospects of her own influential theory of emotions as situated conceptualizations.

As usual, be in touch with ideas for future issues, information about upcoming conferences, reports on especially promising young researchers, and anything else you think may be of interest to the emotion community. And have a wonderful Thanksgiving holiday (if you happen to celebrate it)!

Previous Editor's Columns

- Editor's Column Emotions and Social Engagement Issue
- Editor's Column Understanding Disgust Issue
- Editor's Column Emotional Brain Issue

Sander on ISRE 2015

David Sander, Department of Psychology, University of Geneva

Emotion research has never been so thriving, with original interdisciplinary integrations, new theoretical developments, and innovative methods. This is not only reflected in the impressive increase of research groups or centers that focus on emotion, but also in journals that publish high level emotion research, and in the growing impact our research findings are having on society writ large.

Our goal in putting together ISRE 2015 is to provide you with the most vibrant environment to present your work, to offer you a thorough overview of ongoing developments in the study of emotion, and to showcase the latest discoveries in all disciplines with an interest in emotions broadly understood.

The conference's interdisciplinary and international Scientific Committee (http://www.isre2015.org/Committees) aims to create an exciting scientific program that presents the very best in contemporary emotion theory. The Organizing Committee is also working hard in order to make ISRE 2015 a



success, at all possible levels. Geneva attracts thousands of people each year for meetings, conferences and exhibitions, offering all the advantages of a small city combined with the facilities and services of much larger ones. The conference will be hosted in the Bastions campus, the most traditional site of the University of Geneva.

We look very much forward to your submissions for symposia (of up to 5 papers), individual oral presentations, and posters in all relevant disciplines including psychology, neuroscience, philosophy, sociology, linguistics, affective computing, history, anthropology and the humanities and social sciences generally. Symposia including more than one discipline are especially encouraged to facilitate cross-disciplinary communication in emotion research. Submissions are also possible for pre- and post-conference events (please send an e-mail to ISRE2015@unige.ch with your proposal).

The deadline for abstract submission is 15th December, 2014. Acceptance decisions will be notified in February 2015. Online registration is expected to be available shortly after that: http://www.isre2015.org/important_dates

We are happy to announce the three keynote speakers who will deliver plenary lectures during the conference: Professor Justin D'Arms (Ohio State University), Professor Jennifer S. Lerner (Harvard University), and Professor Tania Singer (Max Planck Institute for Human Cognitive and Brain Sciences).

We believe that ISRE2015 will be a unique opportunity to present cutting edge research, to learn about advances in other fields, and to debate emotions from the uniquely interdisciplinary angle that characterizes ISRE. If you are an emotion researcher – whether from the humanities, the social sciences, the behavioural and brain sciences, or any other domain – be aware that ISRE 2015 welcomes you. We are looking forward to meeting you in Geneva next July!

If you have any questions, please contact the Local Organizing Committee at ISRE2015@unige.ch.

David Sander, ISRE 2015 Program Chair

International Society for Research on Emotion (ISRE 2015) July 8-10 2015, Geneva, Switzerland

Deadline for all submissions: Dec 15 2014

ISRE Matters – Musical Emotions Issue

Arvid Kappas, Psychology, University of Bremen, ISRE's President

The Emotion Pendulum

Call me paranoid, but I do not trust when things go too well. What goes up, must come down. What am I talking about? Well ... are we nudging towards the end of the *Big Emotion Wave of the 20th Century*? Is the pendulum coming back, and will emotion research eventually shrink and wane?

The Golden Age

I remember one of my first courses in psychology at the University of Giessen in Germany was Klaus Scherer's Psychology of Emotion, possibly in 1981. At the time, Klaus appeared, as many were at the time, fascinated by Robert Plutchik's *Emotion: A psychoevolutionary synthesis*, which was published in 1980. Plutchik's book, for those who do not know it, is a blend of review of emotion history and theory as well as an attempt at an integrative theory, much like Magda Arnold's *Emotion and Personality* in 1960, or to make a long arc, Ross Buck's *Emotion a Biosocial Synthesis* that came out just a couple of weeks ago. These books can be exhilarating in making sense of a bewildering matrix of findings, theories, and ideas. All three of them are well worth your consideration, if you are not yet familiar with them. But the times of publication of these three pieces could not be more different!

In 1960, emotions were still a fringe topic – not very central compared to motivation and methodologically stifled under the shadow of behaviorism. In contrast, in 1980 the emotions

were on the rise, and intriguing studies started being published in top journals, from Richard Lazarus' demonstration that cognitions affect physiological responses, to Paul Ekman's work on facial expressions. It is no coincidence that

the International Society for Research on Emotions (ISRE) was founded in the 80s – born out of the excitement that emotions, after all, were a topic worthy of scientific investigation. And, since the very beginning, ISRE has been vocationally interdisciplinary and international, with its founders coming from a variety of disciplines and countries. This has shaped ISRE's mission, which has always been to offer a meeting ground for theorists from different disciplines, and more recently, to stimulate younger researchers to pursue the scientific study of emotions.

Over the next three decades, emotion theory has truly exploded as a research subject. It now looks as though no investigation of the human mind and its capacities can be complete without a proper consideration of the role of emotions. While emotions have always been central in clinical contexts, it is only in the current *golden age* of emotion research that even "hard core" areas traditionally explored under the heading of "cognition" have become emotion-dependent, ranging from decision-making to perception.

In fact, recent work in Affective Neuroscience, starting perhaps with Jaak Panksepp's tome of the same name, has made it clear that the very separation of cognition and emotion is highly questionable,



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despite its intuitive plausibility and reputable historical pedigree. Cognition and emotion are like two hands clapping: it is increasingly hard to imagine any sound produced without their interaction. This is not truly a surprise, or at least it should not be, but it is nice to see neuroscience making this point quite conclusively. So life for emotion researchers has been exciting and challenging for a while now.

What about 2014, the year Ross Buck's book appears: are we *still* in the middle of the golden age of emotion research? Perhaps, but some changes may be gathering on the horizon. "Emotion" is becoming a contentious term. "Affect" is slowly becoming the term of choice to designate the disparate mental states we are trying to understand, in part because it is perceived as being broader and more encompassing. Many of us are arguably starting to feel that they study affect and not emotions, in the sense that emotions are the tip of a larger iceberg of appetitive and aversive motivational states.

I am not sure there are substantive issues at stake here. Whether we call ourselves emotion researchers or affect researchers does not make much of a difference. What about the actual research? Is it changing in important ways? On my highly idiosyncratic reading of the emotion literature, research questions appear to be shifting from trying to define emotions to investigating how paradigm cases of emotions *interact* with other processes. I sense a certain fatigue in the definitional project, but renewed interest in exploring how emotions affect attention or memory, how the brain engineers emotional changes, how genetics and the environment contribute to emotional phenotypes, how mind and body interact in regulating emotion, and so on.

In other words, perhaps research on emotions has shifted from a focus on itself to a focus on how emotions affect other core systems at the biological, psychological, or physical level. I consider this to be a welcome development. In the extreme, even if we never came to an agreement as to what emotions are, we could still make a great deal of progress by focusing on how emotions affect other processes we want to understand. Is this shift really happening in the scientific study of emotions, or is this one of my odd perceptions? You decide.

Are We Leaving The General Public Behind?

But what about the real world? What is the impact of all of this exciting and integrative research in the real world? Well, this is a completely different story. On the pages of women's and men's magazines it still feels like it's 1970. It is common to read that we can read straight from the face how someone feels, as if years of research showing the importance of the social and cultural context for the encoding and decoding of facial actions had never happened. What might appear simple to us emotion scientists, such as the usefulness of a dimensional framework of valence and arousal to explain certain phenomena, is completely unknown even to science journalists. Affective neuroscience also suffers from problems of public perception, as it has morphed in the eyes of some into a sort of fancy and expensive phrenology 2.0. This is due

in part to the use of untenable localization approaches in some iffy research, but more significantly to bad journalistic reporting, which glosses over all methodological caveats researchers spell out in search for sensationalistic





headlines (Yes, New York Times, I am talking about you as well!).

Additionally, many folks with no real professional qualifications or expertise wear the hat of emotion experts. This has led part of the public to form the false impression that most of the stuff we do is either trivial or irrelevant. In fact – and here is perhaps my most contentious statement – we are not entirely innocent about this state of affairs. As a community, we have failed to properly communicate what emotion research has discovered over the past three decades. Either we simplify too much, or we get lost in arcane debates about details that obfuscate, rather than shed light on, how emotions are generated, how they manifest themselves, how they interact with other organismic systems, how they are affected by culture, and so on. I think we can and should do a much better job at communicating where we stand as a community of researchers. It would also help people understand why their tax dollars/euros/currency of your choice should pay for such research.

But maybe we also need to communicate better amongst ourselves. It is not rare that I sense at our meetings, or in our exchanges online for that matter, the lack of a common ground. There is a canon of acquired knowledge in emotion theory that every emotion scholar should know. Our insular proclivities, I am afraid, often stand in the way of sorting the issues of contention from what is, or at least ought to be, shared background knowledge about what we have already discovered about emotions. I am convinced we can do a much better job educating each other, a key preliminary step toward educating the public at large. Perhaps the grass is always greener on the other side, but I have attended meetings in other disciplines where I have experienced a more coherent body of background knowledge than at emotion conferences.

Should we identify some core curriculum for emotion research? Clearly, such a curriculum would be a child of the present time and the current fashions, but I think there is room for improvement even starting with something biased by the here and now. Having a curriculum of some sort would allow me to get a better sense of what I do not know but should know about what my colleagues have discovered, and improve my ability to appreciate where their views are coming from.

I do not think I am alone in sensing this lack of common ground. In fact, I have been in touch with people who have left ISRE (fortunately not many) because they felt researchers at conferences were too insular and not sufficiently interested in getting up to speed on the central findings in disciplines other than their own. I think this is a central challenge for ISRE, and it reflects the high degree of interdisciplinarity that is inherent in our society. Yet, I think this is an area with much room for improvement. This brings me to a final concrete proposal to make things better.

And now, discuss ...

At this point, I would expect some of you to have strong opinions about what I have just said. Perhaps you think I got it all wrong, or you are persuaded by these ideas, and want to add thoughts of your own. What is the proper venue to share your opinions, and more generally to debate issues of common interest? So far, we have had our biennial meetings, and intermittent spurts of animated dialogue on the listserv. After a long debate inside the executive committee of ISRE, we have concluded that we need a new online forum specifically devoted to discussion. A forum is much better than email – a) because not every post becomes an email that fills our already overflowing mailboxes, b) because debates are much better archived and can be retraced in a forum than in our email black hole, and c) because forums have many more tools to allow for interaction and collaboration. I have set up an online platform suitable to our needs, but before making it public I would like someone to take over the administration. I am looking for a host of the ISRE forum who takes care of allowing people in and doing some of the household chores. Particularly at the beginning, I would like this forum to be restricted only to ISRE members. Please contact me at arvid@starfleet.com if you are interested. The executive committee of ISRE will ultimately decide who gets to be ISRE Forum Host, but I'll be happy to be the intermediary. Note, you must be a member in good standing to take this job!

Cheers,

Arvid

Music and Emotion: There is More to Music than Meets the Ear

Patrik N. Juslin, Department of Psychology, Uppsala University, Sweden

November 2014 – It seems like a paradox: that a 'harmless' cultural artifact such as music may arouse emotions – evolved mechanisms believed to have contributed to human survival throughout evolution. No wonder that emotional reactions to music have puzzled scholars from Charles Darwin and William James all the way to modern day 'affective scientists' (e.g., Juslin & Sloboda, 2010).

Following Arnold (1960), most theories of emotion have presumed that emotions are caused by multi-dimensional cognitive appraisals of events in relation to goals, plans, and motives. However, since purely instrumental music is often regarded as an



abstract art form consisting of mere note patterns, 'explaining emotional responses to instrumental music is a real problem for appraisal theories, and may be a real threat to the generality of appraisals as elicitors of emotion' (Ellsworth, 1994, p. 195).

Many scholars have turned their focus to the musical notes themselves, attempting to find 'direct' links between surface features of the music (e.g., slow tempo) and aroused emotions. But such correlations do not really constitute an explanation: they simply move the burden of explanation from one level ('Why does the 2nd movement of Beethoven's 'Eroica' symphony arouse sadness?'), to another level ('Why does slow tempo arouse sadness?').

Musical emotions can never be explained by musical features alone – there is more to music than meets the ear. To understand musical emotions, we should look beyond the musical structure and consider the meaning extracted by the listener from the musical event (which involves information in the music, the situation, and the listener). We need to consider the underlying mechanism that 'mediates' between a musical event and an aroused emotion: a functional description of what the mind is 'doing' while music is being perceived (e.g., retrieving a memory). This functional process should not be confused with its implementation in the brain, or with the phenomenological experience it seeks to explain.

The most comprehensive attempt to date to explain how music arouses emotions is the BRECVEMA framework (named after the first letters of the eight mechanisms included; see Juslin, 2013). An evolutionary perspective on human perception of sounds suggests that the survival of our ancient ancestors depended on their ability to detect patterns in sounds, derive meaning from them, and adjust their behavior accordingly. Proceeding from this assumption, it is theorized that there are several induction-mechanisms, which range from simple reflexes to complex judgments and which are implemented by a number of only partially overlapping brain networks that developed in an evolutionary progression:

(1) Brain stem reflex, a hard-wired response to simple acoustic features such as extreme or increasing loudness or speed;

(2) *Rhythmic entrainment*, a gradual adjustment of an internal body rhythm (e.g., heart rate) towards an external rhythm in the music;

(3) *Evaluative conditioning*, a regular pairing of a piece of music and other positive or negative stimuli leading to a conditioned association;

(4) Contagion, an internal 'mimicry' of the perceived voice-like emotional expression of the music;

(5) *Visual imagery*, inner images of an emotional character conjured up by the listener through a metaphorical mapping of the musical structure;

(6) *Episodic memory*, a conscious recollection of a particular event from the listener's past which is triggered by a musical pattern;

(7) *Musical expectancy*, a response to the gradual unfolding of the syntactical structure of the music and its stylistically expected or unexpected continuation; and

(8) Aesthetic judgment, a subjective evaluation of the aesthetic value of the music based on an individual set of weighted criteria (see below)

One implication of this framework is that because many of the psychological processes and mechanisms are implicit in nature, and may occur in parallel, music researchers cannot rely merely on phenomenological reports of music experience to explain how music affects emotions. Most of what goes on in the causal process may not be consciously available. Thus, it is necessary to conduct experiments in a laboratory setting, where target mechanisms can be manipulated so as to produce immediate behavioral effects on listeners. Recent experiments in our laboratory have aroused *nostalgia* through episodic memories, *sadness* through contagion, and *anxiety* through thwarted musical expectations (Juslin, Barradas, & Eerola, in press).

Though these results are promising, many complex issues remain. The greatest challenge is perhaps to account for the notion of 'aesthetic emotions': Are there emotions that emerge when and only when a work of art, such as music, is apprehended? A careful review of the empirical findings thus far shows that the states claimed by some researchers to be aesthetic emotions 'unique' to music (e.g., *wonder, tenderness, nostalgia, tension*) also occur in many other everyday contexts that do not involve music, or even works of art more generally. The notion of a 'unique' set of emotions evoked only by music can thus be rejected on empirical grounds. However, I believe the term 'aesthetic emotions' might retain its usefulness, if we define 'aesthetic emotions' as emotions caused specifically by an evaluation of the aesthetic properties of a work of art, for instance, admiration for the skill of the artist or the beauty of the composition. That is, 'aesthetic emotions' might be distinguished by their *causes*, rather than by their being unique states.

I recently made an attempt to outline a psychological model of aesthetic judgments of music, and explored how such judgments might be related to emotions (Juslin, 2013). It is assumed that the aesthetic judgment process (which is not necessarily explicit) begins with a classification of the music as 'art' (see Figure 1).

This leads the listener to adopt 'an aesthetic attitude'. This means that the listener's attention is focused on the music and that 'aesthetic criteria' (e.g., beauty, novelty) are brought to bear on the music. Perceptual, cognitive, and emotional inputs concerning the music are then filtered, through a relative weighting of the subjective criteria by the listener. This evaluation occurs in a continuous manner, although judgment outcomes (e.g., 'this music is awesome!') occur as 'read-out' episodes at specific points in time (e.g., 'cued' by significant moments in the music such as the ending of a jazz solo or the ending of a piece). Liking (or disliking) is a mandatory outcome of the judgment process, whereas emotion is an additional outcome if the result is that the music is judged as extraordinarily good (or bad) overall or on one of the criteria. Based on these ideas, we have recently been able to statistically model aesthetic judgments of music by individual listeners.

A multi-level theory of emotions such as BRECVEMA, with potential interactions among mechanisms, could help to explain the complex emotions experienced in relation to music. A multi-level theory may also help to explain 'the apparent reality of aesthetic emotions': Why do we respond to fictive objects *as if* they were real, even though we know they are not? A key part of the explanation is that our emotions can be evoked at multiple levels of the brain, some of which are implicit and independent of other psychological processes.

Thus, emotional reactions to 'fiction' (e.g., theatre, movies, music) may be treated as 'real' at one brain level, while at

the same time they are 'discounted' at other, 'higher' brain levels (which could ultimately explain the noted lack of

'adaptive action' undertaken). This is just one example of how the study of music can offer novel perspectives on emotions. Emotions can come about in a number of different ways, and we are only just beginning to explore the various processes involved. Current work appears to focus almost exclusively on a multi-dimensional goal appraisal as the underlying mechanism, but evidence of such appraisals comes mostly from 'post hoc' verbal reports that cannot truly distinguish different underlying causes. (The precise proportion of instances in everyday life where emotions are caused by, say, conditioned responses - as opposed to multidimensional goal appraisals - is simply not known.) Music, then, may not be unique in



arousing emotions through a variety of underlying mechanisms which cannot be coherently subsumed under the single heading of 'cognitive appraisal'. In nature, 'functional redundancy' (multiple means to an end) is the rule rather than the exception.

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How Music Grabs the Emotions

Jenefer Robinson, Department of Philosophy, University of Cincinnati

November 2013 – The relationship between music and emotion is among the most contentious issues in the philosophy of music. People differ about (1) what it means to *understand* music and whether emotion plays a role in musical understanding, (2) how music *expresses* emotions, (3) how music *arouses* emotions, and (4) whether the expression and/or arousal of emotions is important to the *aesthetic value* of music.

Musical Understanding

To understand the representational arts such as painting, movies, and literature, you need to understand what they are *about*: what the painting or movie depicts, and what the poem or the novel describes. In contrast, the founder of contemporary musical *formalism*, the nineteenth century music critic Eduard Hanslick, maintained

that musical beauty "is self-contained and in no need of content from outside itself." It "consists simply and solely of tones and their artistic combination" (Hanslick 1986, 28). Music is created out of "the entire system of tones, with their latent possibilities of melodic, harmonic, and rhythmic variety" (ibid.). In other words, to understand music is to grasp its harmonic, melodic and rhythmic structure or form. To understand the 12-bar blues, for example, you need to hear the fixed harmonic progression supporting the vocal line (4 bars on the tonic, two on the subdominant, followed by two on the tonic, two bars on the dominant 7th and two concluding bars on the tonic). To understand Beethoven's Fifth Symphony, you need to hear how the famous Fate theme or melody (Da-da-da-DUM), which is elaborated creatively throughout the length of the work, lends unity not only to the first movement but to the symphony as a whole.

Hanslick was very concerned to establish that music has no "extra-musical" content, and that, in particular, it does not express or represent emotions. One of Hanslick's contemporary devotees goes so far as to say that "it is not essential to music to *possess* emotion, *arouse* emotion, *express* emotion, or *represent* emotion. Music, in itself, has nothing to do with emotion" (Zangwill 2004: 29). In other words, music *in itself* is nothing but complex structures of tones, a bit like the moves in a game of chess.

Despite adhering to the formalist position, the music theorist Leonard Meyer has argued that the emotions can nevertheless play a role in understanding music. His ingenious idea is that if you have heard a lot of music in a particular *style*, you will have expectations regarding how the music is going to unfold. If, relative to such expectations, you are in turn surprised, bewildered, disappointed and satisfied by what happens in the music as it unfolds, this can be an indication of musical understanding, even if you are not trained in harmonic analysis (Meyer, 1956). The psychologist John Sloboda suggests that music can elicit thrills and chills when it "[teases] structural expectancies" by "repeatedly creating and resolving tensions." (Sloboda 1999). Moreover, even formalists agree that great music can elicit emotions of admiration or excitement when its melodic, harmonic and rhythmic structure are appraised as beautiful and well-crafted (Kivy 1990).





Deeper than Reason: Emotion and its Role in Literature, Music, and Art (2007)

The Musical Expression of Emotions

Most listeners, however, think that there are far more important relationships between music and the emotions than those countenanced by formalist theorists. Almost all music accompanied by words, from the Beatles' ebullient "I wanna hold your hand" to Adele's wistful "Someone like you," seem to *express* powerful emotions. Are these emotions the composer's or the performer's or both? Even though the performer appears to be expressing her own emotions (and perhaps channelling those of the composer), on reflection it is the "character" impersonated by the singer whose emotions are being expressed. If a singer were actually experiencing deep grief, she would likely be unable to sing at all. Just as the actor impersonating Hamlet is expressing *Hamlet's* world weariness when he says "Oh that this too too solid flesh would melt...," so, when Adele sings "Sometimes it lasts in love but sometimes it hurts instead," she is expressing the emotions of the fictional *character* she is impersonating in the song, even though such emotions may occasionally mirror her own grief and hurt.

Things get more complicated when it comes to 'pure' instrumental music. According to some philosophers, this sort of music is rarely, if ever, a genuine expression of anyone's emotions. When we say that a piece of instrumental music expresses an emotion, all we mean is that musically informed listeners *experience it as resembling* sounds or movements that are characteristic of the emotion in guestion (Davies 2006). Just as the face of a basset-hound

expresses sadness regardless of how he's actually feeling, so music can wear the *appearance* of an emotion without there being any actual emotion present. Thus, music expressive of sadness is simply music that *sounds* sad – listeners experience it as resembling moaning or weeping – or that moves in a sad way – it is experienced as resembling someone who moves along in sluggish, plodding fashion. But according to "appearance emotionalism," the music's sadness is only an appearance; it is not a manifestation of anyone's actual or imagined state of mind.

There are a number of problems with this suggestion. First, it follows that only emotions with a distinctive vocal or behavioural expression can be expressed by purely instrumental music. This rules out many of the emotions that Romantic composers in particular thought of as paradigms of emotions expressible by



music: love, longing, nostalgia, despair, and awe. Since these emotions do not have a characteristic "appearance," they are not expressible according to the "appearance emotionalism" view. Secondly, this proposal does not account for the fact that music can move us deeply by virtue of the emotions it expresses. Empathetic responding would not make much psychological sense if we were simply responding to a resemblance in sound and movement, whereas it is much easier to understand if we take instrumental music to also express the emotions of someone to whom we car emotionally relate (Robinson 2005).

In short, we should reject "appearance emotionalism" in favour of the so-called "persona" theory of musical expressiveness. This theory generalizes from the way that a song expresses the emotions of a character impersonated by the singer to the way that 'pure' instrumental music expresses emotions, and maintains that music is expressive of emotions if it is "readily heard" by musically informed listeners as a genuine expression of emotion in an imagined musical persona, which may, but need not be, the composer (Levinson 2006). Thus in Beethoven's Fifth Symphony in C minor, the protagonist seems to be expressing first his heroic determination in the face of an insistent Fate, and later his triumph over Fate when, at long last, C major overcomes C minor at the very end of the work.

Following Beethoven, composers in the Romantic and post-Romantic periods made large-scale symphonies, quartets, and sonatas that are not simply *formally* coherent but *psychologically* coherent as well, in the sense that the development of the music is not just harmonic and melodic but mirrors the psychological "narrative" of an imaginary persona. This does not mean that listeners are free to impose their own psychological fantasies on the

music. Robert Hatten, in particular, has been careful to anchor his psychological interpretations in conventional musical "topics" such as marches that reference the military, hymns that reference the religious, and bagpipe drones that reference the pastoral. In this way even "pure" instrumental music can acquire *meaning* (Hatten 1994, Robinson and Hatten 2012).

The Arousal of Emotions by Music

Plato famously said that much music has a dangerous emotional influence on the young, and today's parents still worry about the effects of rap and heavy metal on the tender minds of their offspring. But to emotion theorists a more pressing problem is how music *manages* to arouse emotions at all. If you think that emotions have to be set off by an appraisal of real life loss or threat or whatever, then it is profoundly puzzling how music can arouse emotions in anybody. However, it is well documented that music gives rise to physiological reactions, expressions of emotion (weeping, smiling), action tendencies and so on (Juslin and Västfjäll, 2008). Hence one mechanism whereby emotions are aroused by music is via a kind of emotional contagion: listeners are put into a bodily state characteristic of some emotion and consequently begin to experience the bodily feelings in terms of the corresponding emotion.

This causal mechanism may explain why sad and happy music makes listeners feel sad and happy respectively, but i does not explain how music can arouse emotions that lack distinctive behavioural or physiological symptoms and/or are cognitively complex. The Geneva Emotional Music Scale (GEMS) identifies emotions that listeners report having experienced in response to music, and which are relatively rare in ordinary life. They include, among others, wonder, nostalgia, tenderness, and feelings of power or transcendence, all seemingly cognitively complex emotions (Zentner, Grandjean, and Scherer, 2008). Wiebke Trost and her associates have discovered some of the neural architecture underlying the complex emotions identified by GEMS (Trost et al, 2012). Moreover, if music can indeed arouse complex emotions, this allows for the possibility that listeners – at least sometimes – respond empathically to the psychological journey of an imagined protagonist, whose shifting emotions are expressed in the music, as the persona theory of expression describes. I might empathize with the hero in Beethoven's Fifth who struggles against Fate, and in imagination adopt his courage and determination. I may also feel compassion for his predicament and admire his fortitude. Similarly, we may weep for the character Adele is impersonating as she expresses her grief for a lost love (Robinson 2010). Also, you may enjoy this Saturday Night Live skit about Adele's "Someone Like You".

The Aesthetic Value of Music

Empirical psychologists typically focus on how, when, and why people get emotionally aroused by music, without special regard to the aesthetic *value* of the music that they listen to. Philosophers of music, on the other hand, are by and large motivated by a desire to comprehend what it is about great music that makes it great. After all, if music is basically just structures of tones, as the formalists claim, why should it be so meaningful and aesthetically valuable?

The formalist has a tentative answer to this question. There are 85 notes on my piano, but the tonal system which organizes them has inexhaustible possibilities. The greatest music there is, say Bach's Preludes and Fugues or Beethoven's symphonies and string quartets, show the inexhaustible possibilities of a tonal system built out of these minimal materials. Music exhibits to a high degree the fertility of the human mind and the creativity of the human imagination. But even if this is a valuable feature of music, it does not explain the degree to which music matters to listeners in ways that go well beyond the importance of other expressions of human creativity (e.g. mathematics). For many people, the key to the aesthetic value of music is that it is not just creatively crafted out of a limited set of ingredients, but also that it expresses emotions in a beautiful or vivid way. If, like many contemporary musicologists, you accept the persona theory of musical expression, then the value of music has a more intuitive explanation: listening to music is being exposed to the emotions of an imagined persona, expressed with a vividness and beauty that life itself rarely matches.

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Musical Emotions Across Cultures

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November 2014 – Music and emotion are culturally situated and embodied. Any given musical event is situated in a particular historical moment and place, performed by, and listened to, by particular people. Each performer, each listener brings to the event a way of thinking and feeling about the music, a particular expectation of what will/should happen. These expectations are not merely individual but are culturally inflected. I have tried to capture their contribution to the experience of music by introducing the concept of a *habitus of listening* (Becker 2010), a set of conscious and unconscious musical propensities that affect how an individual reacts to music emotionally. Bourdieu, who coined the term *habitus*, likened a *habitus* to "a predisposition, tendency, propensity, or inclination" (Bourdieu 1977). One's own *habitus of listening* is dependent upon culture, personal history, and the total context of the musical event.



Communal musical events are universally much more prevalent than is solitary music-making. From huntergatherers, to agriculturalists, to performers in highly industrialized societies, music performance is predominantly social (Nettl 1992; Ichikawa 1999; Locke 1996; Johnston 1989; Breen 1994). Most peoples of the world play, dance, and listen to music in the presence of others. Thus, emoting at a musical event is also not a solitary event, but one that is shared by other people, often in close physical proximity.

Our appreciation of music is embodied, in the sense that we engage with the music with our whole bodies, not just with our brains. This form of bodily engagement with music is known in the biological sciences as *entrainment* (David 2002; Clayton, Sager, & Will 2004; Clayton 2007). Entrainment is the synchronization of organisms to an external rhythm, a biological phenomenon that is found among all peoples and can also be found in insects such as fireflies and mosquitos (Gibson & Russel 2006). The simplest external example of human entrainment to music is foot-tapping. Entrainment is not found in any other primates besides humans and is believed to be the basis upon which our musicality arises (Merkel 2000; Patel, Iverson, Bregman, Schulz I. & Schulz, C. 2008; Honing 2012).

Our bodies resonate with both the music and the other bodies that may be present. A sort of contagion, palpable in any successful musical event, takes place between the emotions of the performers and the emotions of the listeners (Davis 2002; Janata, Tomic, & Haberman (2012); Stephan, Walter, & Wilutsky (2014); Feld & Keil 1994). Even after the music has gone silent, physical engagement with remembered sounds can continue. Margulis (2014) described the sensations of participants of a religious ceremony after a session of highly energetic music as follows:

"After an extensive period of joint and repetitive singing, it is almost impossible not to continue to experience the sound of the looped phrases, as well as the tactile sense of the muscle movements involved in producing those phrases. Each individual in the silent gathering persists in having a sense of "being sung," even as no one moves or makes a sound." (Margulis, p. 141)

The coordination of feeling, motion, and emotion characteristic of participatory musical/ dance events, and the social bonding that results from it, have been described as a contributing factor of human evolution (McNeil 1995; Freeman 2000). Mirror neuron research further strengthens the scientific basis for the "community of feeling" that is commonplace at a successful musical performance (Gallese 2001). We both influence and are influenced by the other bodies at a musical event.

The situated, embodied and social nature of musical emotions suggests the need for descriptive distinctions between varieties of the "same" music-induced emotion in different cultures and contexts. For instance, one often

hears or reads about music making people 'happy' (Becker 2004, p. 52). And yet, musical 'happiness' has different inflections in different places.

In the city of Yogyakarta, in Central Java, Indonesia, to celebrate the birthday of Mohammed, once a year a grand festival (*Grebeg Maulud*/ *Sekaten*) takes place on the palace grounds of the prince. In the extensive courtyards of the palace, two very large and sacred gamelan ensembles are positioned on two raised platforms and play, simultaneously, different pieces, for several hours during each day of the festival. The gamelan ensembles are large and loud. The overlapping, non-coordinated sonorous sounds of the two ensembles contribute to creating a communal state of joy. *Ramé* is defined as a situation that is "noisy, bustling, alive with activity" (Horne 1974) and that evokes an extroverted, Javanese happiness at being in a large crowd enveloped by multiple sounds that are in not "in harmony."

This musically inspired, communally cross-bodied emotion, *ramé*, within the context of a noisy religious festival in Central Java contrasts with the Arabic concept of *tarab*. A concert of traditional Arabic music, the context within which one may experience *tarab*, is "highly interactive and emotionally charged." *Tarab* is a quiescent state of happiness that turns one's attention inward, a musically induced state of ecstasy or enchantment that leads listeners to feel that time has come to a standstill (Racy 2003, p. 5-6). *Tarab* is, like *ramé*, also highly valued, and when the performer is skilled, also appears to sweep over an audience.

In certain parts of the US Midwest, there are regular gatherings of people of Polish ancestry who get together to dance and listen to polka music (Keil, C. 1995). These gatherings are, in part, a reaffirmation of their cultural ancestry, as well as a chance to reconnect with old friends and relatives. A certain amount of beer-drinking adds to the pleasures. The result is a particular kind of musical emotion called 'polka happiness,' an existential joy that envelops the participants of these events.

"The meaning of life is 'polka happiness'. It's the bliss when Li'l Wallys band is playing from the heart, emotions are overflowing, and people are dancing on the tables." (Keil and Keil 1992)

Polka happiness, *tarab* and *ramé* are musically joyful emotions that are both personal and communal, and that spread throughout a crowd, examples of what the cognitive scientist, Nuñez, refers to as "supra-individual biological processes" (Nuñez 1997).

"By *supra-individual biological processes* I mean those processes relative to life that occur at a level beyond the autonomous beings one is studying . . . The processes intervening in the spread of a cholera epidemic are an example of [supra-individual biological] processes: the phenomenon is manifested in individuals (those who actually get sick are individuals) but it is realized through biological processes that take place beyond the sick individual (i.e. the network of biological processes that make the epidemics possible).

... another very simple example: speech accents ... Accents – although manifested in individuals – have to do with biological processes that are realized at levels that go beyond the individuals, and that explain why speech accents are neither randomly distributed among populations nor are they genetically determined." (Nuñez 1997, p. 155)

The spread of musical emotions at communal musical events is contagious, and like epidemics and language accents, it can also be understood as a biological process. While most music-making world-wide is communal and social (and possibly biological in the sense just described), in the Western industrialized world, music listening is commonly solitary. IPods, earbuds, and headphones are ubiquitous. The listener seems alone, and thus emotionally not affected by the presence of others.

Even so, the music often implies a social context such as a symphony orchestra, a rapper before a live audience, or a DJ at a club. A solitary basement musician producing a multi-track composite performance is likely to mentally invoke a social context. During music making for solitary pleasure, memories of first hearing or first learning the piece (when, where, and from whom) and previous experiences of playing and hearing it are evoked. Musical pieces, like performers, are saturated with contextual, social memory.

An exception may be the solitary iPod listener who consciously creates an alternate reality.

"I've walked that way for – I don't know how many years . . . and it's very boring, so having the music makes me see things that I would see everyday in a kind of new way – like a leaf falling or something. It might be like, "Wow, a leaf has fallen!" (Herbert 2011, p. 58)

Such uses of musical listening may approximate the kind of consciousness that one might try to cultivate as a Zen practitioner. The claim can be made that isolated, non-social listening is a particular *habitus of listening* aiming for a heightened, meditative engagement with the world.

How should these reflections impact the scientific study of emotions and music? For one thing, the fact that experiencing music often involves simultaneously participating in a ritual, or some communal, highly interactive social event points to the need for emotion researchers to develop tools for pursuing research on musical emotions outside of the laboratory. The trouble with studying musical emotions exclusively in a laboratory setting where the musical input is recorded and the listener isolated is that we inevitably leave behind the communal element of musical experience that I have argued is so central for understanding the nature and importance of our experience of music.

Experiencing music in isolation stands to experiencing music in a culturally situated setting as inner speech stands to dialogue: although we can get a glimpse of what music and language are for without understanding how they connect people, the full communicative power of both only becomes available once we shift our perspective from the intrapersonal to the interpersonal, and explore music and language as communicative and situated social tools.

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Musical Emotions in the Brain

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November 2014 – Unveiling brain networks that mediate music-induced emotions, or musical emotions, is challenging but of great interest for several reasons. First, musical emotions represent a remarkable and intriguing experience that may yield precious insights into the workings of the human mind. Second, musical emotions lack the sort of obvious adaptive function and cultural invariance characteristic of basic emotions, preventing a direct appeal to evolutionary explanations for their origin. Third, and relatedly, because musical emotions are very



different from affective phenomena traditionally investigated in neuroscience, such as fear, joy, disgust, and so forth, they offer useful avenues to study emotions across a wider range and thus compare their neural underpinnings across more diverse samples of affective subjective experiences.

Fourth, studying the brain mechanisms of musical emotions can help us understand the neurocognitive processes at play in the perception and production of music itself. Still another reason is that building bridges between brain science and musical art might eventually give composers or performers novel tools to exploit in artistic creation (conversely, neuroscientists can gain new insights from the work of musicologists and musicians). Of course, these are just a few of the reasons to be interested in musical emotions, and many others certainly apply.

Arguably, neuroscience research has yet to fully exploit the richness and originality offered by emotions in the music domain. A large majority of studies has investigated brain activation patterns associated with dichotomous categories such as pleasant/positive vs. unpleasant/negative emotions. This "standard" approach parallels classic neuroscience work on "basic" emotions and primary reinforcers, such as reward and fear (Armony & Vuilleumier, 2013). However, it does not cover the whole range of emotional experiences in the music domain, which prominently include awe, wonder, and sublimity – i.e., feelings that are often considered as belonging to a special category of "aesthetic emotions" (Zentner, Grandjean, & Scherer, 2008). Conversely, some of the emotions commonly experienced in non-musical contexts – e.g., fear, anger, or even plain happiness – are not frequently experienced when listening to music Therefore, classic dichotomous distinctions between pleasant/unpleasant or between appetitive/aversive affective dimensions may prove less informative about the neural substrates of musical emotions than about other emotion types investigated in neuroscience.

Another limitation is that many studies using brain imaging techniques such as fMRI or PET have focused on activation patterns associated with emotions during relatively long period of time, typically averaging the brain response over music segments of 20-60 seconds. Although this slow time scale might fit aesthetic emotions better than more basic emotions (such as fear or disgust), it is likely to miss important dynamic features linked to the rich temporal structure of music (such as mixture or rapid succession of different emotions, or expectations built by progression and repetition in music scores). Other neuroimaging techniques with higher temporal resolution, such as electro-encephalography (EEG) or magneto-encephalography (MEG), have been used to examine responses to transient and elementary musical features (e.g. linked to rhythmic, harmonic, or syntactic structure), but surprisingly less often to investigate musical emotions, perhaps reflecting the difficulty to precisely define the onset and duration of these emotions.

All these caveats aside, neuroscience research has already provided abundant data illuminating several key aspects of music-induced emotions (for review, see Koelsch, 2014). A number of pioneering and elegant studies using PET and subsequently fMRI have consistently shown that pleasurable music activates brain regions usually responding to

other pleasures and rewards such as the ventral striatum, but also orbitofrontal cortex, anterior insula, together with frequent activations in parietal and somatosensory areas (Blood & Zatorre, 2001; Menon & Levitin, 2005). Similar activations in striatum are found for music evoking joy and happiness (Mitterschiffthaler, Fu, Dalton, Andrew, & Williams, 2007); sad music, on the other hand, has been reported to activate hippocampus, amygdala, and neighboring medial temporal lobe areas, which are implicated in negative affective states and anxiety. Comparing unpleasant dissonant to pleasant consonant music produces similar effects (Blood, Zatorre, Bermudez, & Evans, 1999; Koelsch, Fritz, DY, Muller, & Friederici, 2006).

Furthermore, elegant work combing pharmacological PET with fMRI has demonstrated that transient peaks of pleasure experienced during music correlate with release of dopamine in ventral regions of the striatum (nucleus accumbens), distinct from more dorsal sites of dopamine release associated with anticipation of the corresponding musical moments (Salimpoor, Benovoy, Larcher, Dagher, & Zatorre, 2011). Feelings of "chills" triggered by one's preferred music also correlate with increased activity in both striatum and insula, accompanied by transient reductions in activity in amygdala, anterior hippocampus, and ventromedial prefrontal cortex (Blood & Zatorre, 2001).

Furthermore, although fear may not be truly evoked in listeners, it can be expressed by music (as in horror movies) and often produce increased activity in the amygdala (Aube, Angulo-Perkins, Peretz, Concha, & Armony, 2014). Interestingly, these amygdala responses overlap with those to other stimuli (such as faces or voices) evoking similar emotions (Aube, et al., 2014), and damage to the amygdala may impair recognition of fear as expressed both in music and faces (Gosselin, Peretz, Hasboun, Baulac, & Samson, 2011). Altogether, these findings have been taken as evidence that music can evoke "true" emotions (rather than more "abstract" or "intellectual" states of mind) – although such conclusion is partly fraught by a problem of "reverse inference" (Poldrack, 2006). Indeed, activity in the limbic system (including amygdala) does not necessarily equate with emotional experience and amygdala activity is often elicited without any reportable feeling (e.g. in response to subliminal emotional stimuli or visible non-emotional stimuli such as eyes).

In contrast, research in psychology has often emphasized a different kind of aesthetic emotions elicited by music, beyond basic emotions such as joy, sadness, and fear, or dichotomous distinctions between pleasant and unpleasant emotions. Based on ratings made by large groups of participants exposed to various genres of music, with more than 500 emotion terms, Marcel Zentner and Klaus Scherer (2008) proposed a set of "music-specific" emotions corresponding to those most commonly reported during music listening across genres. This model distinguished 9 main categories of emotions commonly experienced while listening to music: joy, sadness, tension (fear or worry), wonder, nostalgia, tenderness, power, peacefulness, and transcendence.

Together with Wiebke Johanna Trost, we recently set out to investigate the neural underpinnings of these complex, possibly "music-specific" emotions (Trost, Ethofer, Zentner, & Vuilleumier, 2012). Although commonly reported by music listeners, aesthetic emotions (such as wonder or nostalgia, etc.) have not been systematically studied in brain research. Moreover, rather than applying dichotomous comparisons by contrasting pairs of pre-selected pieces (e.g. pleasant vs unpleasant, joyful vs sad), we designed a parametric approach allowing participants to report different emotions with different intensities for the same music piece. By analyzing subjective ratings for several excerpts from the classic repertoire, we found that the 9 emotions described by Zentner and colleagues (2008)



were distributed in a bidimensional space corresponding to the typical organization of valence (from negative to positive) and arousal (from calmness to excitement) (Russell, 2003; see Figure 1). This "circumplex" has often been described as defining the major ingredients of a variety of emotions, including basic categories, across various stimulus modalities (faces, voices, etc.) (Russell, 2003).

Brain activity measured by fMRI in our participants showed that higher ratings along the positive valence axis correlated with selective activations in dopaminergic pathways (ventral striatum and tegmental area) and insula . Conversely, higher ratings of arousal correlated with activation in auditory cortex, but also anterior cingulate, premotor cortex, and more dorsal regions in striatum (caudate), all regions associated with vigilance and action (Figure 1). However, emotions within the same class of valence or arousal were distinguished by variations in the degree of activation of these two basic networks, in combination with differential recruitment of other brain regions.

For instance, relative to joy (which was associated with verbal labels referring to dancing and elation, see Zentner et al. 2008), wonder was associated with activity in striatum, but weaker increases in motor related areas and greater increases in memory related areas including hippocampus. Conversely, tension (encompassing feelings of worry and uneasiness) was accompanied by activation in cortical and subcortical motor pathways, similar to joy, but not in ventral striatum. On the other hand, hippocampal regions and medial prefrontal areas usually involved in self-reflective processes and introspection were activated during positive emotions with low arousal such as nostalgia and tenderness, but not during sadness, where selective increases instead were seen in medial parietal areas and subgenual cingulate cortex, a region implicated in depression and emotion regulation.

Taken together, these findings indicate that the neural representation of aesthetic musical emotions accords with an organisation into two basic dimensions of valence and arousal, similar to emotions evoked by other stimuli (Russell, 2003) and subserved by brain networks usually implicated in reward and vigilance functions, respectively. This adds further support to the notion that these emotions emerge from brain activity patterns partly shared with other emotions, including the more "basic" categories. However, these data also reveal a finer differentiation that is not accounted by traditional bi-dimensional models. More specific types of musical emotions appear to imply additional recruitment of other brain networks, outside those typically associated with emotion processing and the bidimensional construct of valence and arousal; in particular, these emotions also engage networks involved in motor, memory, self-reflective, and even visuo-spatial functions.

These data highlight the fact that emotion differentiation is partly determined by the cognitive processes concomitantly engaged with appraisals of value and motivational significance (Leventhal & Scherer, 1987). In addition, recent studies suggest that differences in emotional responses to music may also reflect changes in the functional connectivity (i.e. synchronization) of emotion-related areas such as the amygdala (Koelsch & Skouras, 2014) and striatum (Salimpoor, et al., 2013), with other distant brain regions including hippocampus, sensorimotor areas, medial prefrontal areas, or auditory cortex. This in turn also underscores the dynamic nature of emotional responses across distributed brain networks (Eryilmaz, Van De Ville, Schwartz, & Vuilleumier, 2011), rather than in terms of simple dimensions mediated by emotion-specific brain structures.

In sum, these findings converge to depict musical emotions as an embedding of multiple processes mediating sensory, motor, and cognitive functions (e.g. memory, attention) into a coordinated configuration of brain activation imbuing them with particular affective or motivational values. This in turn illustrates the fact that studies of the "complex" emotions induced by music may allow going beyond traditional models based on basic categories (Turner and Ortony, 1992) or polar dimensions (Russell, 2003). Moreover, this recruitment of sensorimotor and cognitive processes by music and concomitant emotions echoes the increasing amount of studies suggesting that music may yield significant benefits in training various cognitive and sensorimotor abilities, usefully exploited for rehabilitation in neurological patients or aging (Forsblom, Laitinen, Sarkamo, & Tervaniemi, 2009; Moore, 2013; Wan & Schlaug, 2010). A better understanding of the neural substrates of music-emotions may thus not only illuminate central questions about the nature of emotions in the brain but also open the way to novel and more efficient therapeutic applications.

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Lisa Feldman Barrett: Why Emotions Are Situated Conceptualizations

An Interview with Andrea Scarantino (November 2014)

Lisa Feldman Barrett is University Distinguished Professor of Psychology and director of the Interdisciplinary Affective Science Laboratory at Northeastern University. She received the NIH Director's Pioneer Award in 2007, and was elected fellow to the Royal Society of Canada in 2012. Her research focuses on the nature of emotion from both psychological and neuroscience perspectives, and takes inspiration from anthropology, philosophy, and linguistics. She is one of the main champions of a new wave of emotion theories that go under the heading of psychological constructionism. Her specific brand of constructionism is called the Conceptual Act Theory, because it gives pride of place to situated conceptualization in the construction of emotion episodes. Dr. Barrett has published more than 160 scientific articles, and she is the editor of several influential collections, including the Handbook of Emotions (4th edition, in progress) and the recently published The



Psychological Construction of Emotion. In 2014, she founded the Society for Affective Science (SAS) jointly with James Gross.

You grew up in Toronto, Canada. Do you come from a family of intellectuals? Did your parents encourage you to become an academic? What career did you envisage for yourself when you were growing up?

I was the first person in my extended family to attend university. I do not come from a family of intellectuals. My mother has a high school education, and my stepfather has an 8th grade education. We lived in a middle-class neighborhood but were "working poor." The fact that I enjoyed school and did well was a constant source of tension in our house, as my stepfather was actively hostile to intellectual pursuits. When I was 16, he tried in vain to force me to quit school and get a full time job. My mother managed to be supportive of my education in several ways. As I entered high school, she felt it was important that I learn secretarial skills so that I would always be able to earn a living. Her own career began in a secretarial position and ascended into accounting and eventually managing an office.

Although I grew up in a working poor family, we lived in a middle class neighborhood. My friends' parents were mainly professionals – physicians, lawyers, dentists, etc. So, by comparison, I grew up in a state of relative deprivation for most of my childhood and adolescence. In the social sciences, relative deprivation is associated with tremendous stress. This unrelenting stress, combined with the dynamics of my home life, and my family's low socioeconomic standing profoundly shaped



Lisa at age 5 with her beloved grandfather "Zadie"

my early life experiences and goals going into high school and university.

My desire, at first, was to become a physician. I believed that a career practicing medicine would lift me out of poverty and provide the best protection from ever slipping back there. My high school boyfriend came from a family of

physicians and during high school I spent a lot of time with his family, so I had several role models to learn from. And I grew up in a neighborhood that contained many Jewish families. It was still a pretty traditional thing at that time for Jewish kids (both young men and women) to go to medical school. But university was a time of transformation for me, as it is for many people. At first, I began taking pre-med classes and majored in biology.

After my first year, I switched my major to psychology, and I also began taking courses in anthropology and linguistics (and various other topics, such as history and astronomy). I was very taken with physical and cultural anthropology. For a while, I considered doing a PhD in anthropology but the uncertainties of being able to support myself financially kept me from considering it seriously. All through my undergraduate years, I was working two jobs to put myself through school. At a certain point, I realized that medicine was not the career for me, and I pursued a PhD in clinical psychology instead.

When did you start being interested in emotions and why?

When I entered graduate school to study clinical psychology at the University of Waterloo, in Waterloo Ontario Canada, I was doing research on self-esteem using Tory Higgins's Self-Discrepancy Theory: when people fail to live up to their own ideals, they are supposed to feel depressed, but when they fail to live up to what others' believe they ought to be, they are supposed to feel anxious. Before running any new experiments, I tried to replicate this very standard finding in the literature. I failed. I could not replicate the finding. I tried again. And again I failed. I ran EIGHT experiments in my first three years of graduate school, using various methods, all of which failed.

After resisting the urge to throw myself under a bus, I took a

close look at all the data and noticed a pattern: Most participants, when asked if they were anxious or depressed, had indicated that they felt both or neither; rarely did a participant report one or the other alone. So, the reports of anxiety and depression were so highly correlated that, given the reliability of the measures, there was no unique variance left in either measure to relate to anything else. This might sound like an uninteresting detail, but to me at the time, it was very curious. I wondered: can these participants distinguish anxiety from depression (one supposedly high arousal and the other low)? Is this attention to arousal an individual difference? Is there other



information that is important? Is this variation in emotional granularity a more general phenomenon?

As I transitioned into my first academic position as an Assistant Professor of Psychology, I began to study emotional granularity more systematically as a

feature of emotional intelligence. I wanted to assess whether the finer grained distinctions between different feeling states that constituted emotional granularity were actually *accurate* representations of emotions. To assess accuracy, a scientist must compare a respondent's reports to a set of objective (perceiver-independent) criteria. This led me to review the literature on the facial and body actions (a.k.a. "emotional expressions"), autonomic changes, and brain activity that were supposed to distinguish one emotion category from another. I certainly was not the first person to review this literature – every decade or so, a review of literature failed to turn up a distinctive "fingerprint" for each emotion category. My reviews merely built upon and extended the excellent reviews that were already in print. But these left the field littered with false dichotomies (Were emotions discrete or dimensional? Biological or social? Evolutionary or cultural?). And this left me with the realization that our field had a paradox to solve: How was it that people could experience and perceive distinct emotions like anger, sadness, and fear when after over a century of searching scientists could not discover consistent and specific fingerprints (patterns) to objectively diagnose the



Lisa at age 12

presence or confirm the absence of each one? Solving this paradox would reveal the nature of emotions.

You got your PhD in Clinical Psychology at the University of Waterloo in Canada in 1992. Why did you get your PhD in clinical rather than experimental psychology? And how do you compare the graduate education you received in Canada with the one offered by PhDs in the US?

I became a clinical psychologist because it was the more pragmatic choice to make given my circumstance. When I was applying to graduate school, I had to stay in the Toronto area because I was about to be married (to my high school boyfriend – the one with all the physicians in his family). I applied to two graduate programs – clinical psychology at the University of Waterloo (which was the top ranked clinical program in Canada at the time) and cognitive psychology to work with Dan Schacter at the University of Toronto. I was accepted to both, but Dan was planning to move to U of Arizona, so I decided to go to U of Waterloo.

Graduate programs are so variable within both Canada and the US (and graduate training is so variable even across labs within a single department) that it is very difficult to compare across countries. I will say that I received excellent scientific training that has served me well over the past 20 years. I'm grateful for having been required to take a history of psychology course, a philosophy of science course, and a psychometrics course – such courses are



Lisa in graduate school



often no longer offered in graduate programs, particularly the philosophy of science course. I also had the opportunity to take many statistics courses, which I found invaluable.

You are one of the world's leading psychological constructionists, and you have not been shy about the need for radical theoretical change in emotion theory, focusing your critique in particular on basic emotion theory. Could you explain what psychological constructionism is, briefly trace its historical origin and say why basic emotion theory is no longer adequate?

Throughout the ages, the human mind has been understood using two intuitive theories within the Western philosophical and scientific tradition. In the first theoretical approach, the mind is understood as a collection of separate and independent abilities, or *faculties*, that are basic building blocks for all mental achievements. Each faculty is supposed to carve the mind at its natural joints, and can consequently be characterized as a natural kind (Barrett 2006a). Each faculty is also supposed to reflect a separate *process*, each with its own *distinct and innate physical correlates* (ranging from neurons in a certain brain region, a modular brain circuit or network, or a pattern of bodily correlates). This is known as *faculty psychology*. Basic Emotion Theory is a faculty psychology view of emotion. Certain appraisal theories have a faculty psychology flavor as well.

The second theoretical approach has been around for just as long as faculty psychology, although it was never really identified by a single, unifying label until Jim Russell and I started calling it *psychological constructionism*, and more recently we and our colleagues have taken to calling it *constructionism* (because it incorporates different types of construction at the neural, psychological and social levels). Psychological constructionism has almost always been proposed in a way that is embedded as a criticism of faculty psychology and only recently has developed into a more mature theoretical approach with its own set of novel questions, hypotheses, methods and analytic tools.

Constructionism has two main hypotheses: (1) faculties are not separate and independent abilities but rather folk constructs that include highly variable instances, and (2) faculties are not basic building blocks of the mind but their instances are constructed from more basic, domain-general processes. As a result, either the search for natural kinds should take place at lower levels of analysis, i.e. the level of the processes that are the building blocks of the faculties, or it should be abandoned altogether.

Psychological construction has been with psychology from the very beginning of its history. Psychology emerged as a scientific discipline in the 19th century when the experimental methods from neurology and physiology were applied to search for the physical basis of the mental categories posited by faculty psychology. But criticisms of faculty psychology followed suit, as can be seen in works by William James and Wilhelm Wundt, who expounded clear psychological construction hypotheses. Emotion science is an excellent example of this historical divide between contrasting paradigms.

The idea that there are separate and independent "emotion faculties" can be found in the work of Herbert Spencer, Charles Darwin, Floyd Allport and William MacDougall. By the mid-20th century, this idea had been tested and rejected (e.g., Hunt, 1941; Duffy, 1934a, b; 1941; Dunlap, 1932; Harlow & Stanger, 1932, 1933). In the process, nascent psychological construction views were proposed, but not with sufficient detail that they could be tested. The "emotion faculties" view was then resurrected five decades later as "basic emotion" theory (Ekman, 1972; Izard, 1977; Tomkins, 1962, 1963), with striking resemblances to earlier versions of this idea (in particular, Allport to Tompkins and MacDougall to Panksepp). I have recently started to call this the "classical view" of emotions.



Wilhelm Wundt (1832-1920)

One version of appraisal theory also proposes a classical view of emotion. Appraisal views are united by the assumption that emotions are acts of meaning — a perceiver assigns value or meaning to an object that creates the emotional response. There are two versions of this influential research program that rest on what is meant by "appraisal" and "appraisal processes". In some models (e.g., Arnold, 1960; Lazarus, 1991; Roseman, 1991, 2011; Scherer 2009), "appraisals" are specific mental processes that create meaning; an "appraisal process" is a cognitive mechanism that initiates specific emotional responses (e.g., an evaluation of threat produces fear). I have referred to these as "causal appraisal models" (Barrett, Mesquita et al., 2007; Gross & Barrett, 2011).

In other models (e.g., Clore & Ortony, 2013; Smith & Ellsworth, 1985), an "appraisal" is a way of experiencing the world during an emotion; an "appraisal process" refers to any process that produces this experienced meaning (e.g., to be afraid is to experience something as threatening, and appraisal processes are whatever creates that experience of threat). In these models, appraisals are mental contents (not processes) that are themselves caused by more basic, general mental processes that are



Charles Darwin (1809-1882)

available within any normally functioning human mind (the processes of perception, categorization, memory, etc.). In the past, we have referred to these as "constitutive appraisal models" (Barrett, Mesquita et al., 2007; Gross & Barrett, 2011). Causal appraisal models belong to the "classical view" and are highly similar to revised basic emotion theory (Ekman & Cordaro, 2011). All of them propose (more or less) that each emotion category is populated with instances that have some variation, but that most instances contain a diagnostic synchronized physical change that makes the emotion what it is (and that results from the pattern of appraisals that caused it).

After reviewing the scientific evidence, including the newer literatures on brain imaging, lesion work in humans and in non-human animals, and the electrical



Bottom right is the ventral view, as if you are looking at the brain from the bottom

stimulation work in humans from the latter part of the 20th century and first decade of the 21st century, I have come to the conclusion that the classical view of emotion is disconfirmed by a growing number of empirical findings (e.g., Mandler, 1975; Barrett, 2006a; Barrett, Lindquist et al., 2007; Gendron et al., 2014a, b; Guillory & Bujarski, 2014; Lindquist et al., 2012; Ortony & Turner, 1990; Russell, 2003). This time, however, psychological construction theories are being offered that are sufficiently detailed to allow for their scientific evaluation (e.g., Barrett & Russell, 2015).

You ask "why basic emotion theory is no longer adequate"? In my view, basic emotion theory has never been adequate. It tells a compelling story wrapped in the protective cloak of Darwin, and it matches our everyday experiences and intuitions, but the actual scientific evidence for it is far from watertight. Nevertheless, scientific papers, textbooks, newspaper articles, documentaries, and science shows continue to describe the existence of universal "basic" emotions as a proven fact, disregarding the presence of a century of disconfirming evidence.

Your specific brand of psychological constructionism is labeled the Conceptual Act Theory. What are its core tenets, and what is the main empirical evidence for it? Also, which features of other theories of emotions does CAT take on board?

The Conceptual Act Theory is less than a decade old, so I am not sure that the "main" empirical evidence for it has even been collected yet. But there certainly already is a significant, and growing, amount of evidence consistent with the theory. Due to space constraints on this interview, I will only be able to provide readers with references where the relevant empirical evidence is spelled out. CAT has four central tenets:

Variation: an emotion word like "anger" or "fear" names a category that is a population of instances that vary significantly in their physical nature, because individual emotional episodes are tailored to the requirements of the immediate situation. As a result, the instances within emotion categories are heterogeneous, and they include both typical and atypical instances that differ in important ways reflecting different situational demands (Wilson-

Mendehnhall et al., 2011; Wilson-Mendenhall et al., 2014). This contrasts with the faculty psychology view of emotion categories as being characterized by instances that share physical signatures with a limited degree of variation. The Conceptual Act Theory uses population thinking (inspired by Darwin's *On the Origin of Species*) which assumes that a category can be composed of individuals with unique properties and features so that "average" or "typical" individual of the category can only be described in statistical terms (Mayr, 2004). This means that the instances of an emotion category share no necessary and sufficient features, and the prototype of the category does not have the most frequent or typical properties of its instances, but instead is a stereotype that represents the ideal or goal of the category. Our background



assumption, which follows Larry Barsalou's influential work on this matter, is then that emotion categories are goalbased categories.

Core Systems: each instance of an emotion category is constructed from the interactions of domain-general core systems not specific to emotions, including core systems for interoception, exteroception, conceptualization, attention and executive control, and so on. These core systems are what I have previously referred to as the "ingredients" of mental states (cf. Barrett, 2009), which are combined into different emotion instances according to situation-dependent "recipes". For example, there is a set of networks that are structurally intrinsic to the human brain consistently engaged across a variety of different emotion categories, and outside of the emotion domain (Barrett & Satpute, 2013; Lindquist et al., 2012). Consistent with these ideas, the Conceptual Act Theory also incorporates the concept of degeneracy, or the idea that a given instance of emotion can be constructed in multiple ways, with multiple recipes (i.e., many neural representations can produce one functional outcome; Edelman & Gally,2001). This contrasts with the faculty psychology view of a dedicated neural circuit corresponding to each emotion category or corresponding to each cognitive evalution that causes an instance of an emotion category.



Emergentism and Holism: emotional episodes cannot be deconstructed and reduced either to specific neurons, swaths of brain tissue, or networks, as faculty psychology would have it, or to the domain general systems whose interaction is responsible for producing emotional episodes. Rather, emotions are emergent phenomena which result from interacting core systems in the same way in which water molecules result from the combination of hydrogen and oxygen molecules. A corollary of emergentism is holism, the idea that we can only understand the workings of each core system in the context of its dynamic co-activation with other core systems. For example, intrinsic brain networks interact dynamically to predict the intensity of different varieties of sadness, fear, and anger over time (Raz et al.,

under review). Furthermore, using pattern classification on our meta-analytic database, we have been able to identify a pattern to identify each emotion category, where the pattern is described as a set of interactions between intrinsic networks. It is tempting to believe that each pattern is the biomarker or neural essence of each category. In fact, this is how many scientists tend to interpret pattern classification (e.g., that all instances of an emotion category (e.g., anger) could be represented by small, dedicated population of neurons represented by its pattern). Unfortunately, pattern classification does not actually work like this.

Each activation map correctly classified as anger (be it for a person, as in Kassam et al., 2013, or for a study, as in our meta-analysis), does not have to contain the entire pattern identified for the category anger; it only has to contain a set of voxels that is closer to this pattern than to the pattern for any other emotion category. For example, each map could contain unique subsets of the pattern. Each of these subsets is therefore *sufficient* to instantiate anger, but not necessary for it, in the sense that another episode of anger may involve another non-overlapping subset of voxels. Therefore, it is not correct to claim that the pattern classifier identifies a small dedicated set of voxels that corresponds to each emotion (e.g., anger). The logic is similar to studies of prototype categories. Each instance of the category membership, and they don't co-occur anywhere but in the prototype (Posner & Keele, 1968). As a consequence, our study shows that different patterns of network interactions represent a summary of the activations for each emotion category, and each instance of emotion classified within that category contains either some of that pattern or something closer to it than to the other patterns.

Social Reality: the key proposal of the Conceptual Act Theory is that an instance of emotion emerges when a

momentary array of sensations from the world combined with sensations from the body is categorized as, say, anger or fear as a situated conceptualization. For instance, a change in blood pressure, or a smile for that matter, becomes anger when it is categorized as such in the course of a situated conceptualization. Via categorization, sensations acquire functions that are not intrinsic to them, which is the idea at the heart of emergentism. For example, a person can freeze when faced with danger. But fear is something more than just the act of freezing with its concomitant bodily changes. When a human categorizes a suite of physical changes as fear, this perception provides the physical state with new functions that intrinsically shape what the person will do next and how others will react to that person. This is why a brain circuit for freezing is not a brain circuit for fear: what a mere focus on freezing and its concurrent physiological changes misses is the way in which the act of categorization endows freezing with a social meaning that is crucial for understanding how it will affect the subsequent interaction between the emoter and the world (for further discussion, see Barrett, 2012).



This way of understanding emotion episodes has a number of important theoretical consequences. I will briefly mention four. First, embodied concepts, as a way of organizing past experience, play a very central role in creating experience. The brain uses its store of conceptual knowledge to create emotional instances. Think of the brain as a predictive organ. It is continually using its store of embodied concepts to predict upcoming sensory inputs from the body and the world, and, in doing so, it categorizes them and creates meaningful experiences that we call situated conceptualizations. So the brain is not constructing emotion in a reactive way. It is constructing emotional instances based on embodied conceptual knowledge and held in check by incoming sensory inputs from the body and the world.

Second, CAT explicitly proposes that emotional experience and emotion perception are constructed in exactly the same way, namely by enacting conceptual knowledge during categorization to construct situated conceptualizations with arrays of sensations. Third, there is no sharp distinction between emotion generation and emotion regulation, in the sense that the very act of categorization that instantiates the emotion marks the beginning of the regulatory process of deciding what to do about it. Fourth, there is no distinction between an emotional state (a set of behaviors

and physiological responses) and the experience/perception of that state. All emotional episodes are constructed as perceptions – they are the result of the way that the brain makes meaning of incoming sensory inputs from the body and the world.

The Conceptual Act Theory shares the following assumptions with other theories:

- 1. Like basic emotion theories, the Conceptual Act theory is an evolutionary view of emotion. The CAT takes its inspiration from the conceptual innovations presented in Darwin's *On the Origin of Species*, rather than from Darwin's *The Expression of Emotion in Man and Animals* (which is a conceptual throwback when compared to Origins; see Barrett, 2013; Barrett, forthcoming). Instead of assuming that natural selection sculpted domain-specific mechanism for each emotion (a position which suffers from the weaknesses of the "adaptationist programme" chastised by Gould and Lewontin, 1979), we hypothesize that the brain's functional architecture contains domain-general processes that interact and from which emotions emerge. In principle, domain-general processes are favored by evolution for their efficiency and flexibility (Laland & Brown, 2002).
- Like basic emotion theory, our view is that emotional episodes can contain species-general elements (actions that all species share, such as freezing, fleeing, or fighting); in our view, however, there is no one to one mapping between a specific behavioral adaptation (e.g., freezing) and an emotion category (e.g., fear) (Barrett, 2012; see also Gross & Canteras, 2012). Furthermore, species-general processes are not sufficient for emotion; species-specific processes that exist only in humans (or perhaps in limited form in great apes), such as abstract emotion concepts and language, are also required.
- 3. Like "appraisal" approaches, the CAT views *emotions as acts of meaning making*. The CAT hypothesizes that emotions, like all mental states, arise through the continuous process of perceivers making meaning from the sensory input that they take in from the internal world of the body and the external world of physical surroundings. The CAT is more consistent with constituative appraisal theories than causal appraisal theories.
- 4. Like other classical views, the CAT is a functional account of emotions (Barrett, 2012). An emotion is enacted when embodied conceptual knowledge is brought on line to shape the perception of a physical state, binding that physical state to an event in the world (so that the physical changes in the body are experienced as "about" something in the world). A body state or an action has physical functions (e.g., changes in respiration might regulate autonomic reactivity or widened eyes increase the size of the visual field), but these events do not intrinsically have functions *as an emotion*; events are assigned those functions in the act of categorizing them as emotion during the construction of a situated conceptualization.
- 5. Like social construction theories, the CAT also acknowledges to *the importance of social situations*. If the conceptual system for emotion is constituted out of past experience, and if past experience is largely structured by people within a cultural context, then the vocabulary of emotion categories that develop, and the population of instances within each category, will be culturally relative. In this way, the Conceptual Act Theory also has the potential to become *a deeply culturally-sensitive view of emotion*. Culture is not an independent variable with emotion as the dependent variable culture does not cause emotion. Instead, emotions are performances of culture, enacted and structured through the conceptual knowledge that is enacted and transmitted as part of socialization and acculturation. Emotions are events that function as bids to structure relationships and interactions.

You can read more about these hypotheses, as well as how they are similar to and different from other theories of emotion, in the following papers:

Barrett, L.F. (2011). Bridging token identity theory and supervenience theory through psychological construction. *Psychological Inquiry*, 22, 115-127.

Barrett, L. F. (2011). Was Darwin wrong about emotional expressions? *Current Directions in Psychological Science*, *20, 400*-406.

Barrett, L. F. (2013). Psychological construction: A Darwinian approach to the science of emotion . *Emotion Review, 5,* 379-389.

Barrett, L. F. (2014). The conceptual act theory: A précis . Emotion Review, 6, 292-297.

Barrett, L. F. (2015). Ten common misconceptions about the psychological construction of emotion. Chapter to appear in L. F. Barrett and J. A. Russell (Eds.), *The psychological construction of emotion.* New York: Guilford.

Barrett, L. F. (2015). Construction as an integrative framework for the science of emotion. Chapter to appear in L. F. Barrett and J. A. Russell (Eds.), *The psychological construction of emotion.* New York: Guilford.

Jim Russell, another major proponent of psychological constructionism, distinguishes between having an emotion – e.g. being afraid – and having a meta-experience of emotion – e.g. categorizing oneself as afraid. This opens the door for categorization omissions (having emotions without categorizing them) and mis-categorizations (having emotions and categorizing them wrongly). Are these possibilities on your theory? For instance, can one undergo an episode of jealousy without realizing it, at least while having the episode? Can one self-categorize as angry while being afraid instead, as alexithymic patients are said to do? Finally, can emotions ever be unconscious on your theory?

According to the Conceptual Act Theory, every waking moment of your life, your brain categorizes sensations from the outside world and from inside your body using knowledge from past experience. This categorization process constructs all perception and experience, including perceptions and experiences of emotion. In the Conceptual Act Theory, the hypothesis is that without the categorization of sensations, an emotion does not emerge. Similarly, uncategorized visual sensations produce experiential blindness (see Barrett, 2012); uncategorized sounds are heard as noise instead of music or words. Most of the time, the categorization process is automatic, effortless, and proceeds with no sense of agency. So most of the time, it is possible to experience emotion without explicit awareness of being engaged in an act of categorization superimposed on the array of sensations (this is true even though emotion word knowledge is more accessible during the categorization process).

The Conceptual Act Theory makes a distinction between the on-going momentary categorizations that create phenomenal consciousness (the content of what you experience), and the self-categorizations that occur when people engage in reflective consciousness (your ability to explicitly label and report on what you experience). This is roughly similar to Ned Block's distinction between phenomenal consciousness (the way it is like to be in a mental state) vs. access consciousness (the reportability of the mental state). I am not sure if this is the difference that Jim is trying to capture with his distinction, but in the Conceptual Act Theory, the categorization that creates the phenomenal experience and the categorization that creates the self-labeling (on the occasions when it occurs) need not be the same event.

Sometimes people ask "can emotions be unconscious?". I would answer – "only if visual perceptions can be unconscious." If you can see unconsciously, or hear unconsciously, then it is also possible to emote unconsciously.

One final thought: To my knowledge, alexithymics don't self-categorize as one emotion (e.g., anger) while being in a different emotional state (e.g., fear). Alexithymia is defined as a difficult experiencing emotions. People who describe themselves as alexithymic report a lot of somatic (bodily) sensations like stomach aches, as well as general affective feelings (valence and arousal), but they have impoverished mental representations for emotion. Recent evidence suggests that an impoverished conceptual system for emotion is at the core of alexithymia. As a consequence, these folks fail to categorize bodily sensations as emotional and instead experience them as undifferentiated affect or as bodily symptoms. Moreover, I don't know how anyone can scientifically defend a statement like "this person reported feeling angry but really he was anxious." A statement like that is scientifically meaningful if, and only if, there are objective (perceiver-independent) criteria to verify the presence of anger and anxiety. To my knowledge, no such criteria have been identified yet (see my response to your next question).

If the situated application of concepts is essential to having emotions, as CAT suggests, can animals and

infants have emotions? If not, how would you describe what many would characterize as the anger of a restrained infant or as the fear of a rat in a conditioning experiment?

A century of study reveals that questions phrased like, "Is a restrained infant angry?" and "Can a rat feel fear?" cannot be answered in a scientifically meaningful way. I say this because to answer them accurately, we must be able to compare an infant's behavior or a rat's behavior to an objective (perceiver-independent) set of criteria that can be used to verify when a person or non-human animal is angry or fearful. How do we know that when an infant struggles she is angry? How do we know that when a rat freezes it is afraid? The only way to know for sure is if there are criteria for each emotion that are consistently and unambiguously related to each behavior of relevance.

To my knowledge, there is no set of behavioral or biological measurements that can specifically verify the presence or absence of any emotion. I have to admit that it continues to puzzle me that people find this a controversial claim. A quick look at the literature reveals that for every finding consistent with the classical view of emotion, there are dozens that disconfirm it. For example, there is no clear and consistent brain marker for any category of emotion. Scientists can really no longer claim that the amygdala is the seat of fear, or that it supports "fear learning" per se (although clearly certain amygdala nuclei play a role in threat and safety learning).

A rat freezes when it is exposed to a tone that was previously paired with a shock, but only when it is tested in the small box, and only when the tone has a certain loudness. If the rat is restrained in the small box when it hears the tone (which should not matter because it is about to freeze anyway), its heart rate goes DOWN, not up. If the rat can escape, it will run away. If the rat is cornered and the threat is not ambiguous, it will fight. And not all of these behaviors require an amygdala. Freezing, fleeing, and defensive aggression are all responses to potential danger, so which corresponding circuit is the fear circuit? Is this evidence of many fear circuits, as some scientists want to claim? If so, then we must grapple with the scientific value of the category "fear," beyond



its obvious utility for communicating research findings to people who do not study emotion.

The case of fear is no different than the case of any other emotion category. In good humor and with the best of intentions, I challenge anyone to show me a pattern of objective (perceiver-independent) behavioral and biological criteria, culled from the scientific literature, that is sufficiently consistent and specific enough to diagnose the presence of an emotion (and only that emotion). The best that anyone can do in that regard is to provide a pattern that is hypothesized diagnostic, and then to attempt to explain away all the disconfirming evidence with a variety of caveats (we need better measures, better experiments, more precise definitions, etc.). Some of the caveats might have merit, but the fact still remains that our field takes the biomarker issue on faith despite our collective failure to finc a single reliable set of biomarkers for emotions.

To assess validity and accuracy in our experiments, we routinely use perceiver-dependent measures as a substitute

for the perceiver-independent measures we lack. That is, we use one person's judgment to validate another person's report (e.g., in the study of emotion perception, we compare perceivers' reports to each other, or to what the experimenter expected). From a scientific standpoint, these are not really measures of accuracy or validity. As measures of consensus, they are more like reliability. Furthermore, we typically use criteria that are *stipulated*, rather than *discovered*. For example, in the study of emotional experience, we compare selfreports or physiologic measurements to what the experimenter expected based on his or her a priori hypothesis of what is expected for a given emotion category, not to some perceiver-dependent or objectively derived set of criteria that have been discovered.



Since the criteria we routinely use are perceiver-dependent, a properly formed question must take the perceiver into account: "To an adult human perceiver, is the infant angry when restrained and is the freezing rat afraid?". This is a very different question from "what do the infant and the rat experience?" Here is how the Conceptual Act Theory would answer such questions. From the perspective of an adult human perceiver who has concepts for anger and fear, then the answer is yes, the restrained infant is angry and the freezing rat is afraid.

From the perspective of the rat, the answer is no. The rat does not experience fear. Non-human animals have the circuitry for affect, and they also can learn concepts and form categories from them. But the question is whether they have the brain circuitry available to learn the kind of concepts that emotion concepts are, and whether there is any behavioral evidence that they can acquire these types of concepts. And the answer seems to be no (although great apes might have some very limited ability).

From the perspective of the infant, the answer is more nuanced. Newborns are like non-human animals – they have the circuitry for affect, and they also can learn concepts and form categories from them. By the time infants are four to six months old, the brain is starting to develop the relevant circuitry to learn the kind of concepts that emotion concepts are, and statistical learning experiments have shown that infants of this age use words that they hear as the foundation for learning new concepts that are similar in type to emotion concepts. So, from the perspective of the infant, anger might occur when restrained as soon as the concept of anger has been acquired. Before that, there is only activated negative affect (from the infant's perspective).

In a 2011 paper entitled "Context in Emotion Perception", co-athored with Batja Mesquita, and Maria Gendron, you argue that context is crucial for the perception of facial expressions. Which contextual cues are most relevant for facial expressions?

I would phrase the question differently. From the perspective of the Conceptual Act Theory, people are making meaning of sensory input from the world and from their own bodies. This means that an emotion perception is constructed not only from another person's facial actions, but from their bodily movements, vocal movements, the social setting, the environmental background, the perceiver's own homeostatic state, and so on.

In other words, faces and bodies are continuously moving, but we perceive these actions as events that have a beginning and an end (we engage in event perception), and we infer that the actions are caused by a mental state (the emotion). In social psychology, this has been called action identification, ordinary personology, and just plain person perception (Vallacher & Wegner, 1987; Gilbert, 1998; Bruner & Tagirui, 1954; for a discussion, see Barrett, 2006b).

Moreover, because during social interactions we tend to look at each other's faces when we interact, we are accustomed to think of the face as the most important feature in emotion perception, with everything else serving as context to the face. Yet there is scientific evidence that this is not the case. Research by Aviezer, de Gelder, and Russell & Widen has shown time and time again, in both children and adults, that when other perceptual features (e.g.

the body) are pitted against a face in an emotion perception task, the face loses. This is because information in a face

is more ambiguous and therefore perceptions of the face are more malleable. Also, as young infants learn to perceive affect in others, they learn it from multimodal cues first, and only later acquire the capacity to perceive it in a face alone (and only sometime after that they can perceive discrete emotions).

How have fMRI studies, currently the most widely used tool for the study of the emotional brain, been helpful to figure out how the brain implements emotions? What do you make of Panskepp's claim that direct electric stimulation of the brain has shown the existence of at least seven basic networks in the brain shared across mammalian species? What is your current view of the architecture of the emotional brain?



Serena Williams at the 2008 U.S. Open, after beating her sister Venus (Matthew Stockman/Getty Images)

Brain imaging methods have been instrumental in changing our understanding of how the human mind works, and therefore have been transformative in formulating better questions and experiments about the nature of emotion. We have learned, for example, that the brain does not lie dormant, waiting to respond to stimuli from the external world, but instead is actively building and testing generative models of the world in anticipation of incoming sensory input. From the brain's perspective, "the world" includes not only the exteroceptive sensations from the external world, but also the interoceptive sensations from the "internal world" of the body.

My view is that the brain achieves this generative model-building not with a system of "mental organs" corresponding to independent modules for each mental faculty, but with its integrated architecture of domain-general networks that are intrinsic to the architecture of the human brain. As a consequence, there is no "emotional brain" separate from the "social brain" or the "cognitive brain" (for a discussion see Barrett & Satpute, 2013). Every person has one brain, populated with a set of intrinsic networks, and these networks work together to construct mental events that we give psychological names to as emotions, cognitions, and perceptions.

Brain imaging studies, as useful as they have been, suffer from a variety of important limitations. Scientists often focus on the spatial and temporal imprecision



of fMRI, and of course I would not disagree. But there are other concerns that I think deserve attention. For example, most studies are tremendously underpowered, having too few trials with too few participants. As a consequence, the brain can appear to be more compartmentalized in function than it actually is (when assessed by other imaging techniques, or when compared to those fMRI studies conducted with sufficient power).

Within many experiments, signals are analyzed as discrete, independent events (trials), rather than as a continuous stream with temporal dependencies at

different time scales. Usually scientists design their experiments to look for a single brain:mind correspondence, rather than acknowledging the possibility that there could be several different neural representations corresponding to a single behavioral or mental outcome (this is the concept of degeneracy). And in the science of emotion, scientists tend to focus their inquiry on only the most stereotypic stimuli and scenarios, all but ignoring the tremendous variation in emotional life. Only a handful of experiments have explored how instances of emotion vary within a category. And none have mapped this variation on a person-by-person basis. These issues, and others like them, are just beginning to be addressed, and they will refine our understanding of how the brain creates the mind, more generally,

and how the brain creates emotional experiences and perceptions, more specifically.

Rather than repeat my comments about Panksepp's claims (which I outlined in detail in Barrett et al., (2007) pages 300-301), I would point readers to an excellent book by the pioneering neuroscientist Eliot Valenstein, called *Brain Control*, in which he wrote:

"The impression exists that if electrodes are placed in a specific part of the brain, a particular behavior can inevitably be evoked. Those who have participated in this research know that this is definitely not the case. In a large percentage of cases, animals do not display any specific behavior in response to stimulation, even though great care may have been exerted to position the brain electrodes with as much precision as possible. Even in rats, where the behavior is more stereotyped than in monkeys and man, brain stimulation produces very variable results" (Valenstein, 1973, p. 88)

Although Valenstein wrote these words in 1973, nothing that has been published since then would contradict them. I refer interested readers to a recent paper by Guillory & Bujarski (2013) summarizing the past 60 years of intracranial electrophysiological research on emotion, which provides support for the Conceptual Act Theory.

You have also written a lot on the impact of aging and sex differences on emotions. What happens to our emotions as we grow older? Do the emotions of males and females differ, and if so how?

Generally speaking, people report being happier in everyday life as they age (at least in US samples), even though increasing age comes with greater risk of illness and diminished capacities. This phenomenon is called the "positivity effect." Older adults tend to prefer low arousal, pleasant experiences (whereas younger adults prefer higher arousal, pleasant experiences), and they selectively pay attention to and remember pleasant information, creating a comforting "niche" for themselves. Nonetheless, there is more variation here than meets the eye. For example, some studies have found that only older people who are easily able to suppress unwanted material, and to shift their attention from one thing to another, can benefit from attentional maneuverings to experience



more pleasant feelings. Some studies find that as people become progressively more elderly, they begin to again report more negativity. And older people who describe themselves as "neurotic" don't report any change in their emotional experiences compared to when they were younger (they don't report more positivity or less negativity). Excellent work has been done by Isaacowitz, Mather, and Carstensen in this area.

In Western cultural contexts, men and women believe themselves to differ emotionally. At first blush, the findings look pretty straightforward, and tend to run along the lines of gender stereotypes. Using general, retrospective self-report measures, women describe themselves as more emotional than do men, but in moment-to-moment reports, such as those used in experience-sampling protocols, no sex differences are observed (Barrett et al., 1998). In emotion perception studies, female targets who are posing a stereotyped emotional expression are perceived as dispositionally more emotional (they are perceived as "emotional people"), whereas male targets are perceived as merely responding to a situation (they are perceived as "having a bad day") (Barrett & Bliss-Moreau 2009).

But a closer look starts to reveal more nuanced, interesting patterns. For example, men and women viewing images from the International Affective Picture System reported feeling similar levels of subjective arousal, but there were relatively different neural correlates associated with these reports. For women, we observed relatively stronger correlations between subjective reports of arousal and the network associated with the processing of bodily (interoceptive) cues, whereas for men we observed relatively stronger correlations between subjective reports of arousal and activations in visual cortex. These findings illustrate not only that regions of the brain outside of the traditional limbic system correlate with subjective experience of affect, but also that the brain basis of subjective experience of affect is different for different people along gender lines (there is degeneracy in the subjective experience of affect). This variation is not error.



The question of how men and women differ should probably be contextualized by where women are in their menstrual cycles, however, as it has been shown that network connectivity changes with ovarian hormone fluctuation. And we are now studying whether this creates windows of vulnerability for distress and mental illness in women.

You have been extraordinary successful as a grant getter in your career. You are currently sponsored by a National Institutes of Health Director's Pioneer Award (\$3,910,625), a National Institute on Aging R01 (\$3,372,997), a National Institute of Mental Health R01 (\$1,954,208) and many other big grants from the NSF, the National Institute of Child Health and Human Development, the National Institute on Aging, and the Army Research Institute. What sort of advice do you have for young scientists struggling to get grants? And what is your view on the prominence that grants have acquired in the career of a scientist?

In the US, it is very difficult to have a productive research career without federal research funding. In my own lab (the Interdisciplinary Affective Science Laboratory, that I co-direct with Karen Quigley), we have regular workshops on grant writing for our graduate students and postdoctoral fellows. By the time that they depart from the lab, each trainee has written and submitted at least one major application under my supervision.

My advice to young scientists is:

- Attend the grant writing workshops offered at your home institutions.
- If you have never written a grant application before, ask colleagues for examples of their successfully funded applications.

• Think about how to answer the questions that are important to you within the

context of the funding initiatives that are available. For example, several years ago, I did not think of myself as a cancer researcher, but recently I learned that many of the basic affective science questions I have can be productively investigated in a cancer context.

- Talk to the program officers before submitting anything. They are usually extremely helpful in working with you to figure out whether your idea fits within the scope of their program and, if so, how to make it fit optimally.
- Ask at least one senior colleague to review the grant application before it is submitted.

- Remember that even though it will take you several months to prepare the application, a reviewer will only take
 a few hours to read it. So make sure it is written in a straightforward, direct manner. Use headings as road
 maps for the reviewers. Avoid jargon. Pay a lot of attention to the specific aims/summary page. Reviewers will
 anchor and adjust away from that page.
- Use a 1 to 3 ratio. If you need one grant funded, write and submit three applications.
- Be tenacious. Don't give up.

In 2014, you and James Gross founded the Society for Affective Science (SAS). Why did you decide to create a new academic society dedicated to emotions? How do you see it developing in the future, especially with respect to its relation to ISRE? How did the first SAS meeting in Bethesda this past April go?

The Society for Affective Science is not just an academic society dedicated to emotions. ISRE already exists for that purpose.

James and I decided to found the Society for Affective Science for three reasons. First, we saw a scientific need to unify ongoing research in the areas of emotion, stress, pain, neuroeconomics, health, and so on. Second, we also felt there was a need for a yearly meeting with a more specific scientific focus (ISRE is explicitly interdisciplinary across the science and humanities and it only meets biennially). Third, we felt that a society that was explicitly focused on socializing students and young scientists would be helpful. ISRE now admits students as associate members, but in my nearly decade-long period of serving on ISRE's executive committee in one role or another, socializing students into the field was never an explicit goal of the society.

So, in our view, SAS and ISRE complement each other.

As soon as we began to develop SAS, many of our colleagues volunteered to join us. Wendy Mendes put together a fabulous program as chair of our program committee. Our inaugural meeting was held in April 24-26, 2014 in Bethesda, MD, and it was a resounding success, thanks to our colleagues in psychology, neuroeconomics, psychiatry, and neuroscience who volunteered their time to come and participate. We had over 440 attendees. Every session was jam packed with exciting new scientific discoveries. We tried out new programming features like TED-inspired talks, afternoon Salons (where well known scientists were available for informal coffee and chat), and we even had a scientific debate. By all accounts, it was an invigorating event.

With the help of an ever expanding group of colleagues and students, our next meeting will be April 9-11, 2015, in Oakland CA (right next door to Berkeley CA). You can find information about all this at https://society-for-affective-science.org.

And just so we are all clear where my loyalties lie, my ISRE dues are paid up for the next year, and I will be delighted to accept any offers to speak at an upcoming ISRE conference in the future.

What are the emotions you experience more commonly? Would you have been happy in any career other than scientist?

I wear a lot of different hats in a day, and so I experience a lot of different emotions. I am a scientist, responsible for mentoring a lab of 20+ full time researchers, located at two different institutions, in a time of fiscal crisis. My research is considered controversial – fascinating to some and heretical to others. I am the mother of a 16-year-old daughter who is a very keen observer of her parents. I am married to a very funny man (his rendition of the French Taunter scene from Monty Python's Holy Grail never fails to crack me up) who after 20 years of marriage still





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loves me. And I have a tight-knit group of the most loyal, generous group of friends that anyone could ever have. So what emotions do I experience commonly? Love, curiosity, exasperation, irritation, gratitude, desire, confusion, fatigue, inspiration, anxiety, affection.

I love being a scientist, but I think I also could have been a lawyer. On particularly difficult days, I think about opening an ice cream shop.

What are your hobbies?

Cooking. This is accompanied by a certain affection for kitchen

gadgets, well-balanced, very sharp knives, and well-made pots. And a good selection of salts from around the world.

Weight lifting. I have been training with the same personal trainer for the past 10 years. He is the only man who can tell me to get down on my hands and knees and have me oblige.

Gardening. My goal is to leave every patch of land where I have lived more beautiful than how I found it.

Nagging my daughter to clean her room. Enough said.

Reading. It might seem funny for an academic to list reading as a hobby, but I read many different genres of books, and am often reading three or four different books at once. I particularly enjoy reading cookbooks, writing guides, books on philosophy, popular books on physics and natural history, and books on travel. I rely on my close friend, Ann Kring, to recommend the novels that I should read.

Eating chocolate. I have a limitless appreciation for chocolate (preferably dark, and sampled with friends).

For a while I was learning to paint. I was learning to paint in the Dutch realist style (ironic, I think, for a constructionist to learn to paint in a realist style). I was completely absorbed in it, but I had to give it up due to time constraints. I might return to taking lessons again when I retire.

You now live in Boston. What do you like and what do you dislike about the city? What are your three favorite restaurants in Boston? Do you enjoy cooking, and if so do you have a favorite recipe to share?



I love living in Boston. Ocean, mountains – everything is close by – within an hour's drive. The city has great restaurants, a theatre scene, a small music scene. It's easy to get around. And I love my house. If I had a complaint, it would be that there are no really good bakeries that are easy to get to. It is very difficult to get good bread and bagels here.

I don't really have "favorite" restaurants. Or perhaps I should say my "favorites" shift depend on what I feel like eating. It's probably easier to ask me which restaurants I don't like.

If I am in the mood for steak frites, then I love my neighborhood restaurant, Lumiere in Newton. If Thai food will hit the spot, then I like Dok Bua in Brookline. For dim sum, it is Hei La Moon in Chinatown. For roast chicken, it would have been a Boston institution called Hamersley's Bistro in the South End, but they just closed. So now I would opt for the chicken at Lumiere. For pasta, it is a small neighborhood place in the South End called Coppa. For oysters, it would be B&G Oysters (South End again) or Row 34 (Fort Point) unless you want to make the two hour drive to Rhode Island, in which case THE BEST place for



oysters is the Matunuck Oyster Bar in South Kingston Rhode Island. The restaurant is right beside the river holding the oyster beds. For fine dining, it would be a toss-up between No. 9 Park (Beacon Hill) and Menton (Fort Point), both run by the this amazing chef named Barbara Lynch. For donuts, it would be Union Square Donuts (in Somerville); the members of my wonderful lab celebrated my birthday this year with Union Square donuts (get the brown butter hazelnut crunch). For burgers, there is this little take out joint near my house called Lee's Burgers. Really, really yum. The fries are not bad either.

I've compiled a cookbook of the recipes that use on a regular basis, and I share it with my lab each year. Here is a recipe that I concocted when I first moved to Boston and could not find a decent challah that I was happy with. Sometimes, on Fridays, they sell it at our local bakery as "Dr. Barrett's Challah."

- 4 cups flour
- 1 teaspoon table salt
- 21/4 teaspoons dry active yeast
- 1/2 cup sugar
- 1/4 cup olive oil
- 2/3 Cup warm water
- 4 eggs

RECIPES

Instructions

- 1. Warm water in microwave (lukewarm). Stir in yeast. Let stand until foamy (a few minutes).
- 2. Stir together flour, sugar, salt in a mixing bowl (or in bowl for electric mixer).

- 3. In a separate bowl, whisk oil, 2 eggs, 2 egg yolks, plus water/yeast mixture. Pour egg mixture into the flour mixture. Mix with spoon (or paddle attachment) for a minute, until ingredients are fully mixed.
- 4. Cover and let rest for 20 min.
- 5. Kneed for 10 minutes by hand (or 6 minutes on med low speed with dough hook). Sprinkle in more flour if needed to make dough soft, subtle, but not sticky.
- 6. Remove from bow. Shape into boule. Coat with oil and place in clean bowl. Cover with plastic wrap. Let rise for an hour to two hours.
- 7. Punch down and let rise for another hour (optional).
- 8. Divide and braid.
- 9. Preheat oven to 400 degrees F.
- 10. Cover with cloth and let rise for 45 min (optional).
- 11. Whip remaining egg whites until frothy and paint over braided dough.
- 12. Place bread in oven and spray oven with water (30-40 sprays).
- 13. Bake for 30 minutes.

And of course I must offer you something chocolate. This is a chocolate cake from Hamersley's Bistro. I once threw a party just so I could make this cake. Consider it your secret weapon (if you need a great, but easy to make chocolate cake):

8 oz	bittersweet chocolate, chopped (like Guittard or Valrhona)
4 oz	unsweetened chocolate, chopped
16 Tbs	unsalted butter plus more for greasing pan (make sure it is European which has a higher fat content)
½ cup	hot brewed espresso
1 tsp	kosher salt
1 tsp	vanilla extract
5	large eggs
½ cup	sugar
1 ½ Tbs	all purpose flour

Instructions

Heat oven to 350F. Cut a piece of parchment paper to fit bottom of a 9 inch round cake pan. Line bottom of pan with parchment and then butter the paper.

Set a medium heatproof glass or stainless steel bowl over a pan of simmering water so that the bottom of the bowl fits snugly without touching the water (or use a double boiler if you have one). Melt chocolate and butter over simmering water. Remove bowl from heat. Add coffee, salt, and vanilla. Don't overheat or chocolate will seize (and then you must start again with new chocolate).

In a stand mixer with a whisk attachment, beat eggs and sugar together until the mixture lightens and begins to hold



Dr. Barrett's Challah

ribbons, 3-4 min. Fold eggs into chocolate mixture. Stir in flour.

Pour batter into prepared pan. Set the cake pan into a larger baking pan or roasting pan and add hot water to larger pan to fill about 1 inch deep. Bake until care is mostly set with slight jiggle in center, about 40-45 min. Remove cake from water bath and let cool until cold. Run a thin knife around the inside of the cake pan. Invert it onto a regular plate, remove the parchment, and invert it again on to a serving plate. Serve at room temperature.

Bon appetit.

What are you working on these days?

I am writing a popular book on emotion to be published by Houghton Mifflin Harcourt. Tentative title: How emotions are made. Publication will be sometime in 2016.

I am editing the 4th Edition of the Handbook of Emotion with Michael Lewis and Jeannette Haviland-Jones for Guilford Press.

Jim Russell and I have a new edited volume on the Psychological Construction of Emotion (the first of its kind), also published by Guilford. It is now available for purchase.

Please list a handful of articles or books that have had a deep influence on your thinking.

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What do you think is the main question that future affective science should be focusing on?

The study of emotion will be best served by building bridges between silos like affective science, cognitive science, and so on. The only way to really understand the nature of emotion is to understand how the brain creates the mind, according to the big questions: What is the functional architecture of the brain, and how are conscious mental states created within this architecture? What are the nature of concepts and categories? Developmentally, when does a human brain become equipped with the circuitry to learn an emotion concept? Do infants learn emotion concepts the way they learn other abstract concepts? What role do words play? How do words and concepts influence how the brain is wired? If the sensory inputs from the body to the brain (called ascending homeostatic sensory inputs) are specific enough to keep the body well-regulated, then why is interoception so poor? Does this help explain why people have difficulty distinguishing certain types of pain from stress, and emotion? Is core affect a form of core knowledge? Does it really function as a common currency? In everyday settings and contexts, how much variation (or constancy) is there within an emotion category for a given person? Across individuals within the same culture?





Across cultures?

I am also curious to understand what leads people to essentialize psychological categories, like emotion categories, leading them to assume that they are natural kinds. It is well known that essentialism interferes with scientific understanding in biology. It keeps people from understanding concepts like natural selection. For natural selection to work as a force in evolution, it required sufficient variation so that certain forms can be selected to survive and others not, depending on the immediate circumstances. This is not just passing down unchanging "essences" through the ages (like Lamarkian evolution) (for an explanation, see work by Susan Gelman). In my view, essentialism has interfered with scientific progress in the study of emotion. To figure out why this happened, and to find a remedy, would be an interesting scientific project in and of itself.

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Maïa Ponsonnet: Aboriginal Languages, and the Linguistic Representation of Emotions

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My main research focus as a linguist is to explore the way emotional internal states are described and expressed in diverse languages, and how variations in the linguistic encoding of emotions correlate with shared representations and cultural practices about emotions. I do not restrict myself to emotions *stricto sensu*, if these are defined as relatively short episodes accompanied by a number of behavioural responses, including bodily responses (Ekman, 1992; Scherer, 2013). Rather, I consider as falling within the purview of my investigation all *emotionally tainted* internal states potentially available for verbalization, including, besides emotions, moods such as depression, mild affective states such as concern or disappointment, and fairly generic feeling states such as feeling good or bad.



Not every language offers to its speakers the same tools to express and describe emotions. Are any resources common to all of them? How much do these resources vary? Do the variations correlate with the way speakers experience emotions, respond to them, and conceptualize these experiences? In order to anchor such large-scale interrogations in sound research questions, it is initially appropriate to focus on a smaller number of languages.

My research currently focuses on a small set of Australian languages that have long coexisted within a shared cultural context. Having developed in isolation from other languages of the world, Australian aboriginal languages constitute an interesting sample. They offer great potentials for comparisons between them and with the rest of the world's languages—with respect, for instance, to the lexical categories and emotion metaphors they include.

I begin with some general remarks on the encoding of emotions across languages and cultures, and then summarize the contents of my own research on Australian languages.

Language, representations and practices

Language plays a central role in channelling emotions, and in eliciting the socially structuring moral values attached to them. Such values can differ cross-culturally. For instance, in some human groups it is the norm to condemn anger as an inadequate response to social interactions, whereas in other groups anger may be permitted or even encouraged for various reasons (Lutz, 1986; Rosaldo, 1980; Ponsonnet 2013, Forthcoming). Social scientists also agree that emotion categories can be culture-specific, as reflected by the diversity of emotion words across languages (Ogarkova, 2013; Wierzbicka, 1999). Although Wierzbicka (1999) has identified a few possible universals of human languages with respect to emotions (some lexical items such as 'fear'; semantic associations, for instance between emotions and body parts; and more), she has acknowledged that many emotion words do not find simple translations, even in languages that are relatively close geographically and genetically (i.e. that have developed from one single original language). Wierzbicka's famous study of the German category of *angst*, a mix of fear and depression with no accurate translation in English, offers an interesting example in this respect.

Because of specificities of this sort, studying the way people talk about emotions sheds some light upon individual

and shared concepts, views and values about emotions (Wilce, 2009). For instance, anthropologists often collect and analyze the list of emotion words they find in a language, and interpret it as a kind of "blue print" of the emotions that are foregrounded (or hypercognized, to use Levy's (1973, 1984) well-known expression) in this particular cultural context (Myers 1979, Blakeman 2014). This approach is fruitful, but it assumes that representations and practices about emotions are systematically reflected in the tools that are available to talk about emotions in a given language. In my view, this assumption should be questioned rather than taken for granted. While the way speakers talk about emotions certainly tells us *something* about how they conceive of emotions, the correlation between language and representations/practices is not straightforward.

Languages are not merely a projection of people's current concepts. Linguistic tools are also shaped by history: they are partly inherited. A language may have retained words for emotions that were socially and conceptually important in the past, but no longer are in the present. In such a case, it would be inappropriate to infer from the presence of a word for X that X plays an important role in current cultural practices. Such a role may hark back to a long-expired cultural concern, and be preserved in the language through linguistic inertia.

Furthermore, representations and practices may also *be influenced by* language. This hypothesis, known as the "linguistic relativity hypothesis", was articulated by Whorf decades ago (Whorf, 1956). For instance, Whorf suggested, for instance, that the tense system of the Hopi languages influenced the way speakers of Hopi thought about and dealt with time. More recently, the influence of language upon representations has been established for some semantic domains (Malt, Ameel, Gennari, Imai, & Majid, 2011; Malt, 2010).

For example, Levinson (2003) showed that the words available in a given language to indicate directions correlate with the way speakers respond to cognitive tests on how they manipulate objects in space. The words *left* and *right* indicate directions that vary depending on someone's position in space: linguists say that these terms pertain to a relative frame of reference. In contrast, some words, like *north* and *south*, pertain to an absolute frame of reference, which never changes. Some languages have no referential words like *left* and *right*, and use cardinal points to indicate spatial directions in all situations. It has been demonstrated that speakers of such languages respond to spatial-ordering cognitive tests differently than speakers of languages with relative frames of reference. This demonstrates that language influences speakers' representations of space, and the way they behave with respect to space.

With respect to more complex and socially loaded domains such as emotions, the question of the mutual influences between language, representations and practices has yet to be empirically explored. Does language influence representations of emotions, or do representations of emotions influence language; or both? Which specific aspects o language should we attend to figure out the way people construe and experience emotions? These are some of the questions I aim to answer in my research, on the basis of empirical linguistic descriptions.

Dalabon and the dominance of expressive features

In my doctoral thesis (Ponsonnet, 2013, Forthcoming), I described the encoding of emotions in the Dalabon language of northern Australia (Gunwinyguan family). Dalabon used to be spoken by a few hundreds semi-nomadic hunter-gathers living in relatively welcoming open savannah. Nowadays, Dalabon is severely endangered and only known by a handful of speakers—probably a dozen. While some anthropologists have published extensive discussions of emotions among some Australian Aboriginal groups (e.g. Myers, 1986), the *language* of emotions in Australia had only been dealt with in shorter works (for instance Gaby, 2008; Goddard, 1991; Harkins, 1990, 2001; Peile, 1997; Turpin, 2002). My doctoral thesis is therefore the first extensive study of emotions in an Aboriginal language. Thanks to a long experience living with the Dalabon community, I was able to produce a comprehensive description and analysis of how emotions are expressed and described among the Dalabon group. This research is of potential interact to linguiste but also to anthropological and the point.



group. This research is of potential interest to linguists but also to anthropologists and psychologists interested in the emotions.

My studies cover both expressive and descriptive emotional resources. Expressive resources are devices that allow speakers to express their own emotional states. These include intonation and other prosodic features such as variations in voice quality, loudness etc., as well as interjections for instance (which are often associated with prosodic features). Descriptive features, on the other hand, consist mostly of the emotion vocabulary, which allows speakers to straightforwardly describe anyone's states—their own or others.



Maggie Tukumba, a master speaker of Dalabon and an active language consultant., commenting on a recent and very emotional movie

A first observation I made is that Dalabon offers a sizeable emotion vocabulary—more than 160 lexemes (Ponsonnet, 2014a). This is smaller than the English, French or Taiwanese Chinese emotion lexicons for instance, which comprise hundreds of lexemes. Yet, it is larger than some other minority languages studied in the past. For example, Lutz (1980) reports 58 emotion lexemes in Ifalukian (a Micronesian Island, Western Pacific), and Howell (1981) reports only 7 in Chewong (Peninsular Malaysia). In comparison, 160 items is a relatively high figure for a "small" language like Dalabon—small in the sense that even in precolonial times, it probably never numbered more than a few hundreds speakers.

A second, very noticeable observation is that the Dalabon lexicon has very few emotion-related nouns: only 2, one for anger (*yirru*), and one for 'energy, motivation, desires' (*yolh*). The rest of the circa 160 lexemes are verbs and adjectives. This is as if, in English, we could only say things like "I fear" or "I love", and never talked about the

emotions of "love" or "fear". As a result, Dalabon speakers nearly always encode emotions as states of the person rather than independent things.

A third important observation is that, in spite of this quite extensive lexicon, Dalabon speakers make fairly minimal use of emotion words in ordinary, spontaneous emotional speech. Words are certainly used in some contexts, otherwise they wouldn't exist. But at this stage, it remains a mystery (and one that may apply for many other languages) why Dalabon has so many emotion words, when its speakers make so little use of them. Instead, speakers prefer either to describe facts and behaviors that entail emotions (that is, describe a dreadful monster rather than mention the child's fear), and leave it to the audience to draw conclusions about emotional states; or, very frequently, they use expressive emotional resources like intonation and other prosodic features, rather than emotion words, to convey emotions.

In concord with this observation about words, I have observed that expressive features are overwhelmingly frequent in spontaneous speech. For instance, diminutives, i.e. small items that are added at the end of other words to convey emotional coloring (like the English 'y' in *kitty, poppy* etc.), occur as soon as Dalabon speakers become emotional. The employment of these diminutives is a common way to highlight culturally prominent and ethically valued emotions such as compassion. Dalabon speakers use the diminutive *-wurd* when they *feel* compassion, but also when they *witness* compassion, like two persons helping each other out, caring for each other, or sharing something. In such cases, diminutives are used to express moral approval as much as emotional endearment, to remind listeners of their moral duty to be compassionate, and to manifest sharing and caring social behaviors.

An important corollary is that in Dalabon, emotion nouns are not particularly good guides to culturally relevant emotional concepts, because expressive resources such as diminutives, interjections and prosody are the most common means for expressing and talking about emotions. This problem may well generalize to other languages, and it should lead linguists—or anthropologists, or psychologists—seeking some insight onto emotions to take a closer look at some aspects of the language that are less obvious than words.

Sample: a Dalabon expressive statement

The speaker is commenting on a movie. The hero is paddling alone on a swamp in a canoe. The speaker concludes that he's had an argument with his family. Emotions are conveyed by means of intonation and of a diminutive suffix - wurd. There is also a lexical item, the sense of which is quite language-specific: kodj-dadj(mu) 'head'+'cut', 'get sulky and interrupt social interactions in consequence' (see Ponsonnet (2014, Chap 10) for an analysis of this lexical item).

Kah-bal-bon-wurd... Garra denkinu! Kah-kodj-dadjminj. he-directly-goes-DIMINUTIVE with canoe he-head-cut(PAST)

http://emotionresearcher.com/wp-content/uploads/2014/11/Ponsonnet_Rec3_20120713a_001_MT_sample-2.wav 00:00 00:00 00:00

Translation: "He takes off poor thing... With a canoe! He got sulky and left [he cut head]."

Dalabon and Emotion Metaphors

Another important aspect of my doctoral research was the exploration of the role of body part words in the Dalabon emotion lexicon. As pointed out by Wierzbicka (1999), most (if not all) languages in the world use expressions where an emotion is associated to a part of the body, often an abdominal organ—like in English, 'broken-hearted', or 'having guts' (Enfield & Wierzbicka, 2002; Sharifian, Dirven, Yu, & Niemeier, 2008). The status of the association between emotions and body parts has been debated. Many researchers have assumed that such linguistic associations automatically imply that speakers construe emotions as located in, or experienced by, the body part in question. But some linguists have argued that we must resist the temptation to "exoticize" people, and remember that

these associations can be entirely conventionalized and therefore transparent to speakers (Enfield, 2002; Goddard, 1994, 1996; Keesing, 1985). For instance, most French speakers don't interpret *énervé* ('irritated') as a metaphor involving nerves, although the word could be interpreted literally as 'without nerves'.

In order to assess whether body parts yield emotional metaphors, and whether speakers perceive these metaphors or not, let us first get clear on how metaphors work. Generally speaking, metaphors are figurative linguistic devices whereby the label for a (usually more concrete) thing X is used to designate something else Y (usually more abstract), with an implicit comparison between X and Y (Kövecses, 2002; Lakoff, 1987). Hence when we say 'he is consumed by anger', anger (Y) is implicitly compared to fire (X). Because the "target" (here, anger) is usually less concrete than the "source" (here, fire), it has been argued that metaphors help us construe abstract and invisible aspects of the world (Lakoff & Johnson, 1980), and are thus conceptual representations.



A central finding of my study is that although many Dalabon emotion expressions involve body part words, only a couple of abdominal body parts—mostly the belly—yield emotion metaphors in this language (Ponsonnet, 2014b). These metaphors nevertheless represent a significant proportion of the emotion vocabulary, so that overall, emotions are very often represented linguistically as states of the belly. Thus, for example, *kangu-yowyow(mu)* 'belly'+'flow', literally 'flowing belly', means 'feel good, be nice'. Here, someone feeling good is represented metaphorically as someone with a fluid belly. Most Dalabon representations of emotions are built on comparable patterns: emotions are nearly always represented linguistically as states of the person, or states of parts of the person. This is another puzzling feature of Dalabon, in comparison with other languages.

In English for instance (Kövecses, 2000), emotions are often represented as things that can impose an effect on the person who experiences the emotion: natural forces (e.g. fire), enemies and opponents ('he's fighting his fears'). They are also represented as independent things, which can grow autonomously for instance ('hope swells'). These representations of emotions as things or agentive entities are not specific to English. On the contrary, they have so far been reported in all languages for which we have data on the matter. Dalabon stands out in not having such metaphors. Instead, as explained above, it mostly only represents emotions as physical states of the person (Ponsonnet, to appear-b).

Why is it that Dalabon does not have such metaphors, when other languages do? This takes us back to some of the questions raised in earlier sections, namely questions about the mutual influences between language, representations and practices. One explanation of the peculiarities of Dalabon metaphors may be that they reflect culturally specific shared representations and practices about emotions. Some evidence in favour of this explanation is provided by the emotion regulation strategies I have witnessed while living among the Dalabon. Within the Western world, regulation strategies often aim at "unloading" negative emotions and feelings —for instance by talking to friends or to a professional to "get it out".

In contrast, Dalabon speakers avoid discussing emotional traumas. Instead, their strategy aims at monitoring emotional triggers so as to bring about negative or positive emotions at appropriate times. This is very apparent for example in mourning strategies, where people intentionally maximize negative emotions at certain times (for instance, during the funeral), while banning all negative triggers during some periods of time—e.g. there is a taboo on the deceased's name. To overcome grief, Dalabon people orchestrate an alternation of negative and positive emotional states. Such strategies strike me as evocative of the way I monitor my own physical



fitness, shifting my body back and forth from states of exercise to states of rest. Similarly, Dalabon regulation strategies aim to transition between emotional states of the person, rather than representing emotions as things to be taken out, exhausted, or expelled in any way.

The idea that emotion metaphors are a linguistic readout of deep cultural differences is plausible, but far from conclusively established. The restriction on Dalabon metaphors may have other origins. For example, we should consider whether Dalabon emotion metaphors could be constrained by some grammatical features specific to this language. For instance, Dalabon grammar imposes peculiar restrictions on some nouns, and this grammatical restriction could prevent the occurrence of certain emotion metaphors. Since emotion nouns can never be prominent grammatical participants such as subjects or objects, it seems logical that they cannot be represented as agents, which are normally expressed as grammatical core participants in this language.

If this hypothesis became confirmed, then the restrictions on Dalabon emotion metaphors would be a simple consequence of the grammar of the language. From there, they could eventually loop back into cultural differences. Dalabon emotion metaphors could in turn plausibly influence representations and practices about emotions, as suggested in the figure below.



If grammatical features, via emotion metaphors, were proven to influence the way speakers think of and respond to emotions, this would be very significant, because it would confirm the often-debated influence of language upon thought and practices (i.e. validate the linguistic relativity hypothesis I discussed in the first section in the domain of emotions).

Beyond the case of Dalabon: Comparing languages within a cultural network

Dalabon was spoken to the extreme north of the Australian continent, in the part of the Top End peninsula called Arnhem Land. Arnhem Land is a region of approximately the same size as Portugal for instance, which has been somewhat protected from the most violent colonization, and remains a cultural bastion. Reflecting the high linguistic density observed elsewhere on the continent, more than 15 languages were spoken in Arnhem Land alone. Each language was spoken by a few hundreds speakers, and therefore each speaker spoke several languages, so as to interact within a broader social network involving members of the neighboring language groups. Therefore, Dalabon speakers traditionally knew other languages also spoken in this part of Arnhem Land, namely Rembarrnga, Mayali and Jawoyn, each spoken by a few hundreds of speakers. Speakers of Dalabon Rembarrnga, Mayali and Jawoyn lived together: they intermarried so that family units where often multilingual. That is, these language groups formed a cultural unit where a multiplicity of languages were spoken. Therefore, they must have shared most representations and practices about emotions—an assumption confirmed so far by my ethnographic observations.

This affords us an opportunity to compare linguistic differences while keeping fixed the cultural background. If we find out that these languages, unlike Dalabon, have metaphors where emotions are represented as things (not states of the person), this will imply that the restriction on Dalabon emotion metaphors is not culturally, but linguistically induced—that is, that the way people talk about emotions is influenced by the rules of the language they use.

My description of the linguistic encoding of emotions in Dalabon thus lays the ground for cross-linguistic, comparative studies that will shed light upon the respective influence of linguistic and cultural parameters upon the linguistic encoding of emotions. Starting from this small regional group, the study will then expand to take into account a broader sample of Australian languages, including languages from other linguistic families—for instance languages from the Central Desert. The Australian continent, with its mix of cultural and linguistic resemblances and dissemblances, will then constitute an ideal sample to be compared with languages from other continents, and assess the respective role of language and culture in shaping the way humans talk, and think, about emotions.

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