

## The Sense of Summer

Throughout our evolution and cultural history summer has always been the season that has been most clearly defined in our memories and imagination. With the first wafts of warm air and the lengthening of daylight have come the opportunities to grow the food to sustain us through the cold and dark of winter and ensure our basic survival.

Like many things of such profound significance, we have marked the arrival of summer, and the opportunities that it brings with it, in special rituals – our Mayday celebration, based on the ancient Celtic festival *Bealtaine* and other pagan ceremonies, being perhaps the most familiar. The original tributes to the reawakening of fertility and carnal desires may have been toned down a little in the way we greet May morning today, but the significance of this turning point in the year remains very much with us.

The approach of the end of summer has similarly been marked by rituals celebrating the anticipation of the fruits of the season's fertility – the life-sustaining products of seeds sown and animals reared, for which we have thanked gods and spirits through pagan rituals and celebrations, and now commonly in the modern Christian version, Harvest Festival. Our August Bank Holiday, which follows a little later, also has more ancient roots in forgotten festivals such as *Lammas* than today's traffic jams and trips to theme parks might suggest.

Less publicly celebrated these days, except by Druids and New-age Travellers, is the Summer Solstice – the middle of summer and the longest day of the year. In previous times, however, this point in the calendar was of great significance because it enabled the precise fixing of dates and, therefore, the determination of the best times to sow and a means of predicting the times to reap. It was for this reason that our ancient ancestors went to the considerable effort of building Stonehenge. Anyone who has stood within the ring of monoliths, watching the ray of light shoot from the rising sun on

Midsummer's Day to align itself as precisely through the circle's gateway as it did when the stones were first erected five thousand years ago, cannot fail to appreciate the primordial significance of the season.

We might not take these celebrations and rituals quite so seriously now. We no longer worry about whether the harvest will be sufficient see us through the winter – the supermarkets are open all seasons. But summer continues to be a very significant time in our lives. It opens up new opportunities for enjoyment of the environment around us, the pursuit of fun and leisure and social interaction with friends and family – those essential components of a truly *human* life. Summer reminds us of why we are alive.

## The ‘senses’ study

Ask anyone what comes to mind at the thought of summer and you will immediately get a very personal view. Smells, feelings, tastes, sights and sounds – each of us has our own unique set of experiences and reminiscences. There are certainly things in common – Wimbledon, strawberries and cream, the smell of new mown grass. But delve a little deeper and rarely do you find two people who share the exact same set of senses and images. Some people, for example, think back to their childhood days and the freedom of playing outside, or eating ice creams at the seaside. Others call to mind a recent holiday abroad and the evocative noise of the cicadas in the evening. Another group dwell on the less pleasant experiences – the fumes from traffic on a hot day, or the distracting noises at night when the windows are open.

### Preliminary research

In the first part of our research we needed to identify this variation more systematically. We asked around fifty people for their ‘catalogues’ of the senses of summer – the things that immediately sprang to mind when we asked them to think about summer. Using these as a starting point we then brought people together to swap their ideas in focus groups. From these some distinct themes started to emerge from the otherwise highly personal impressions.

### Tastes

While many of our participants immediately thought of strawberries and cream others pointed out, rather mundanely, that these days you can get such fruit from the local supermarket most of the year – they are no longer such a special feature of summer. What most people did agree on, however, was that summer is the season of tastes associated with health – salads and fruit, fresh vegetables and less fat. Even the thoughts of summer drinks had a healthy image to them – out with

vodka and Red Bull and in with long drinks, Pimms with the fruity trimmings, and lashings of lemonade and barley water.<sup>1</sup>

This might, of course, reflect the times in which we live – the pursuit of ‘healthy’ living being a very dominant feature of magazine articles and newspaper columns and very much part of the new ‘lifestyle correctness’. Equally, however, it may simply be that summer has always had associations with healthy rejuvenation of both mind and body – a season in which to build up one’s resistance to the colds, flu and other ailments that the autumn will soon herald.

A second major theme which emerged from the discussion of the tastes was that eating in the summer was much more associated with sociability. Participants called to mind, for example, not just the taste of food and drink but the open air lunches, the barbeques and the parties where these tastes were experienced. The taste of a burger, for example, whatever its quality, is very different when you eat it with friends, sitting in the cool shade of garden shrubbery on a hot July afternoon, from when you pick it out of its styrofoam box on the way home from the pub on a dark winter’s evening.

## **Smells**

The barbeque again featured strongly in participant’s calling to mind of summer scents – that heady mixture of smoke from fat-dripped, hot charcoal that can be identified many back gardens away on a still summer’s evening. But even the air itself, many people thought, smells differently in summer – the more scientifically minded attributing this to the presence of pollen molecules.

Other participants focused on the smells of the seaside – the light ozone of the sea air or the scents of sun tan oils and creams. And, as

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<sup>1</sup> We should note at this early stage that do not undertake research to show the products of companies commissioning our research in a good light – nor, for that matter in a bad light either. The mention of Pimms here arises only from the fact that it was raised by a number of our informants quite spontaneously as one of their major associations with summer.

we would predict, the smell of new mown grass, hay, flowers in bloom and the scents rising from the earth after a shower of rain on a hot day all figured very strongly in the imagination. There was also a consensus that summer has *more* smells than any other season – a greater variation than, say, the evocative but limited smells of garden bonfires in autumn, or even the first scents of damp bluebell woods in spring.

### **Sounds**

From the cooing of wood pigeons to the unmistakable song of the blackbird – everybody thinks of these sounds when they think of summer. But many of our participants focused on less tangible associations. Some said, for example, that because we spend more time outside in the summer, or because we have the windows open when we are indoors, we become much more aware of the many different sounds that surround us. Quite simply, we hear more in summer. Sometimes these sounds are less than welcome – the domestic row in our neighbour's house, or the whine of the electric drill from the DIY fanatic up the road. But generally our informants welcomed the complexity of sound that summer brought with it

Other specific sounds that our participants associated with summer included the chimes of ice cream vans (love them or hate them), the noise of children playing, the rustle of evening breeze in the leaf-laden trees and the drifting music from parties and park concerts.

### **Sights**

The most dominant theme to emerge out of the discussion of the sights of summer was that of brightness. Chiming well with our evolutionary past was the sense of light and its life-giving properties that the season brought with it – the origins of the calendrical rituals of summer that we mentioned at the beginning.

Vibrancy of colour was also associated with this sense of brightness – a sense of things coming to life in the sunshine, flowers blooming and the rich green so closely associated with the English countryside spreading its unique charm. People looked better – more fit and out and about so that we could see them. And, of course, many of the sights of summer were those of people of the opposite sex. Both males and females noted that because people in the summer wear less they take on a more appealing look – tight jeans and T shirts, or crisp white blouses and short skirts. The major consensus was that summer, of all of the seasons, was sexy.

More conventionally, our participants conjured up the sights of river banks and lapping waves; boats and punting; the nostalgic, Constable-like images of the countryside and the roses in bloom round the door of the country pub. In addition to being sexy, the sights of summer are also chocolate box pretty.

## **Touch**

Tactile associations with summer are less obvious than those of the other senses. Why should summer ‘feel’ differently from the other seasons. Surprisingly, however, many of our participants identified a number of touch sensations which defined summer every bit as well as taste, sound or smell. The feel of tanned, tanned skin, for example, was one which a number of people recognised, along with the heat of sun on the face, the feeling of bare feet on grass or sand and the sense of air around the body which loose clothes provided.

Not all of the feelings were positive though. Uncomfortable, itchy and sweaty feelings were quite commonly associated with summer, especially by those obliged to work in places without air conditioning. The stinging rawness of sunburn was also highlighted by informants who had failed to heed the health warnings about the hazards of sun-bathing.

## Moods

A very dominant theme that emerged from the interviews and focus groups was that summer was an optimistic time of the year. There were things to look forward to and a feeling that life was getting better. This was reflected in the perception that people smiled more in the summer, and their happy faces encouraged more positive attitudes in those around them. A few of our informants, however, while recognising the sense of optimism that summer often engendered in them, were a little more cynical – commenting that sometimes this optimism was misplaced and summer turned out to be less fun than they expected. Even these people, however, agreed with the majority that there was a lot more sociability around in summer – people interacted with each other more, went out together in groups more often and spent less time in solitary pursuits and watching TV.

The health theme also appeared again in the discussion of summer moods. Apart from the hay fever sufferers our informants said that they felt much healthier in the summer – partly as result of the effect of sunshine but also of being in the fresh air and changes in diet. And the issue of sex was raised again in the context of moods. Not only did people look more attractive it was, as one focus group participant opined, “always much easier to pull in the summer.” The fact that people tend to wear less clothing in the summer might be partly responsible for the sexual arousal that the season appears to bring. But the consensus was that there was a much deeper connection between summer and feeling sexy – a reflection of the basic mating instincts which are most powerfully revived in summer.

Being more relaxed or ‘chilled out’ in summer was an aspect raised by a number of participants, often referring to the sense of ease experienced while sitting in the sun or on a shady river bank. Some thought that the heat from the sun itself relaxed their muscles – they were not tense and ‘hunched up’ trying to keep warm as in the winter months. At the same time, it was clear that many of our participants

felt that summer was also stimulating – it aroused their senses and gave them a greater sense of energy. It was this interesting mixture of relaxation and arousal that we explored a little deeper with a few of our participants in the final phase of the study, as we discuss later in the final section of this report.

Our younger informants (those in their 20s) tended to associate summer most with the sense of freedom that the end of the spring term at school heralded. There was much nostalgic talk of summer holidays and light evenings which enabled them to be outside and free from the watchful eyes of teachers and parents.

Other informants, perhaps surprisingly, referred to the increased sense of achievement that occurred in the summer months. Yes, there is the temptation to abandon work or study to sit in the sunshine. But the days are longer and there seems to be more time to get things done. It's difficult, some thought, to maintain motivation in the winter when it is already dark by the time 5 o'clock approaches. The early morning sunshine also made them want to get of bed and do things, rather than hide back under the duvet on cold and dark days. Some felt that the arrival of summer light was akin to the end of hibernation – they no longer needed so much sleep and there were positive reasons for being active.

The only downside to summer moods, it seemed, was the result of spending too much. Being out socialising costs money – going on holiday even more. A number of our participants reflected on how much more often they were broke in the summer compared with other times of the year. But they felt that it was worth it.



## The 'Top 10' Senses of Summer

From the interviews with individuals and material from the focus groups we distilled a set of 75 elements – various tastes, smells, sights, sounds and sensations that had figured to a significant extent in the discussions. Vague references, overlaps and one-off mentions were excluded. The final set is shown in Annex A.

A sample of 172 subjects in the age range 22-36 was given a relatively straightforward rating task. Each element was given a score of 0 to 10, with 10 indicating that this element was most associated by them personally with summer in general, and 0 indicating that they thought that the element was not at all associated with summer in general.

The average ratings by all subjects of the Top 10 are shown in Table 1. below.

<b>Top 10 'Summer in General'</b>	<b>All</b>
Blue skies	8.82
Being at the seaside	8.65
Sitting on a beach	8.62
Sun tans	8.31
Barbeques	8.24
Wearing less	8.23
Warm evening breeze	7.98
Sand between the toes	7.96
Noise of a swimming pool	7.63
Wearing sunglasses	7.56

From the table we can see that blue skies, the seaside and beaches, suntans and barbeques topped the summer 'hit parade', with average ratings above 8 out of 10. There were some minor differences between the sexes – males included pub gardens in their top ten while females opted for the smell of suntan lotion and wearing sunglasses, as shown below in Table 2.

<b>Table 2</b>			
<b>Top 10 'Summer in General'</b>	<b>Males</b>		<b>Females</b>
Blue skies	8.80	Blue skies	8.83
Being at the seaside	8.56	Being at the seaside	8.71
Sitting on a beach	8.52	Sitting on a beach	8.71
Sun tans	8.44	Wearing less	8.51
Barbeques	8.28	Sand between the toes	8.27
Pub Gardens	8.08	Sun tans	8.21
Wearing less	7.91	Barbeques	8.21
Warm evening breeze	7.89	Warm evening breeze	8.05
Noise of a swimming pool	7.83	Smell of suntan lotion	8.03
Sand between the toes	7.59	Wearing sunglasses	7.92

While these results are interesting, although perhaps predictable given what we had gleaned from the interviews and focus groups, the 'Top 10' did not reveal the more complex picture underlying the ways in which subjects responded to the rating task. Although blue skies and the seaside etc. had high average ratings, it was clear that there was a considerable amount of variation in the data – some of our subjects gave these elements quite low scores, even 0 in a few cases. What we needed was something that captured this complexity and gave us a psychological 'map' of summer, showing how each of the elements related to the others. So, for example, if you chose bird song as being most strongly associated with summer, which other elements would you be likely to rate highly in this way? Which elements would be grouped closely together, and which would be some distance away from each other on our map of the senses of summer?

A suitably complex statistical procedure for obtaining this view of the pattern within the data is known as Factor Analysis. (For the technically minded this procedure examines the correlations between the elements across all subjects to detect structure in their relationships and the underlying dimensionality.)

The results of the factor analysis are shown as simply as possible in just two dimensions in Figure 1. to provide a map of the senses of summer. Here we start to see something very interesting. In the bottom left-hand area (the group labelled '1') we can see the cluster of most of the 'Top 10' items – the most popular overall. But we also see a couple of the slightly less popular items in this group as well – crowds and sweaty skin.

There is, however, another distinct group of elements clustering together in the top right-hand area of the map, labelled '2'. Here we see elements that tended to be rated less highly overall as being associated with 'summer in general', but which are strongly linked to each other in the minds of our subjects. So, flowers in bloom go together with butterflies, salads, bird song, strawberries, greenery, Wimbledon, sprinklers and hose pipe bans, and Bank Holidays – now doesn't that sound like true summer? And in this cluster sit quite comfortably Pimms and sangria.

In between the two clusters the pattern is fuzzy, with few other meaningful groupings. What this indicates is that there was little consistency in responding to these elements. On the extreme bottom left, however, we can see one of the negative consequences of too much summer partying, the hangover. And this element is surprisingly near the convertible car on our map. That is probably because the convertible generally evoked quite negative responses from our informants. Yes, convertibles were associated with summer to some degree, but the people who drove them tended to be viewed negatively as 'posers' who just wanted to be seen. And so, they belong down there with the hangovers.

The kind of analysis that we have use here is commonly employed in psychological research to uncover patterns of thinking and behaviour which are not immediately obvious from simple views of the data. As far as we know the technique has never been applied to the ways in which people associate various senses and experiences with summer. Sadly, psychologists tend to focus more on the down-side of life, on delinquency rather than good behaviour, and on depression rather than happiness. In our study, however, the method has clearly highlighted the fact that there is more than one sense of summer – there are two quite distinct and meaningful sets of associations here, and more to come in the next section of this report. It is, however, the 'less obvious' group here which perhaps captures the image of summer most succinctly and most accurately.



## Dimensions of Summer

It was clear from the interviews and focus groups that summer is not one-dimensional – there are different ways of thinking about summer. The associations we have with a holiday abroad may be quite different from those we have with our childhood or with working in the summer.

To explore these other dimensions we asked our subjects to undertake some additional tasks – selecting the ‘Top 10’ elements from the list of 75 which they most associated with childhood, holidays abroad, holidays and trips in the UK, and working or being at home.

### Childhood

Table 3 shows the percentage of people in our sample selecting elements that they most associated with summer when they were a child.

<b>Table 3</b>	
<b>Summer as a child</b>	<b>All %</b>
Playing outside	52.11
Being at the seaside	45.77
Sand between the toes	42.96
Chimes of Ice cream vans	42.25
Blue skies	36.62
Sense of freedom	32.39
Being in the park	31.69
Sun tans	30.99
Sitting on a beach	30.28
Bare feet on grass	29.58

Here we can see that over a half chose playing outside, followed by memories of trips to the seaside and sandy beaches. There were a few differences between the sexes, as shown in Table 4. Females emphasised the more sensual aspects – sand between the toes, feet in cool water, bare feet on grass – compared with males, and also included barbeques in their Top 10.

<b>Table 4</b>			
<b>Summer as a child</b>	<b>Males</b>		<b>Females</b>
Playing outside	49.23	Playing outside	55.26
Being at the seaside	47.69	Sand between the toes	47.37
Chimes of Ice cream vans	44.62	Being at the seaside	44.74
Blue skies	40.00	Chimes of Ice cream vans	40.79
Sand between the toes	38.46	Bare feet on grass	36.84
Being in the park	38.46	Feet in cool water	34.21
Being too hot	38.46	Sense of freedom	34.21
Sun tans	33.85	Blue skies	34.21
Sitting on a beach	32.31	Sun tans	28.95
Sense of freedom	30.77	Barbeques	28.95

### Holidays and trips in the UK

Thinking about summer holidays and outings in Britain evoked very different responses from our subjects, as shown in Table 5 below.

<b>Table 5</b>	
<b>Holidays &amp; trips in the UK</b>	<b>All %</b>
Pub Gardens	51.41
Barbeques	45.77
Being more sociable	38.73
Being too hot	36.62
Being at the seaside	32.39
Being by the river	31.69
Feeling thirsty	27.46
Blue skies	27.46
More relaxed	26.06
Noise of a swimming pool	24.65

Pub gardens were most closely associated with the UK summer holiday experience, quickly followed by barbeques and increased sociability. The differences between the sexes here were quite minor, as shown in Table 6 women included wearing sunglasses and the smell of suntan lotion, while for men the Top 10 associations included the noise of a swimming pool, feeling thirsty and waking up feeling good.

<b>Table 6</b>				
<b>Holidays &amp; trips in the UK</b>		<b>Males</b>		<b>Females</b>
Pub Gardens		50.77	Pub Gardens	52.63
Barbeques		46.15	Barbeques	46.05
Being too hot		43.08	Being more sociable	36.84
Being more sociable		41.54	Being too hot	31.58
Being by the river		36.92	More relaxed	28.95
Being at the seaside		36.92	Being at the seaside	28.95
Feeling thirsty		35.38	Being by the river	27.63
Noise of a swimming pool		32.31	Smell of suntan lotion	26.32
Blue skies		30.77	Wearing sunglasses	26.32
Waking up feeling good		29.23	Blue skies	25.00

### Holidays abroad

In contrast to the sociable aspects of summer that were emphasised when thinking of holidays and trips in Britain, thoughts of foreign summer holidays evoked very different responses, as shown in Table 7. Here we see, predominantly, associations of heat, both pleasant and unpleasant, sun tans and relaxation.

<b>Table 7</b>	
<b>Holidays abroad</b>	<b>All %</b>
Sitting on a beach	64.79
Being too hot	56.34
Peeling skin/sun burn	42.96
Wearing less	41.55
Sun tans	40.85
More relaxed	40.14
Noise of a swimming pool	33.80
Being at the seaside	31.69
Warm evening breeze	30.28
Blue skies	30.28

There were only quite minor differences between men and women in our sample in this context, with men emphasising being too hot a little more, while more women were concerned about peeling skin, as shown in Table 8.

<b>Table 8</b>			
<b>Holidays abroad</b>	<b>Males</b>		<b>Females</b>
Sitting on a beach	66.15	Sitting on a beach	67.12
Being too hot	63.08	Being too hot	53.42
Wearing less	44.62	Peeling skin/sun burn	47.95
Peeling skin/sun burn	40.00	Sun tans	45.21
More relaxed	38.46	More relaxed	43.84
Sun tans	38.46	Wearing less	41.10
Blue skies	35.38	Noise of a swimming pool	36.99
Noise of a swimming pool	32.31	Warm evening breeze	34.25
Being at the seaside	32.31	Smell of summer air	32.88
Sweaty skin/hair	27.69	Being at the seaside	32.88

An interesting point to note here is that the ratings for foreign holidays are significantly more negative than those applied to holidays in the UK. In foreign countries, it seems, the excessive heat and sunburn are of uppermost concern, while here in Britain it is the sociability of barbeques and pub gardens which receive more emphasis. Sociability is not even mentioned in holidays abroad, whereas the top three elements of the UK holiday are all social. Perhaps the British Tourist Board should take note!

#### **Summer at home/work**

The increased sociability that summer brings was again emphasised by our subjects when considering home and work life. Half of them placed being more sociable as their top association with summer in this context, as shown in Table 9. The noise from open windows, however, came second in the table overall, suggesting that not all contacts with neighbours are entirely welcome in the summer. And, of course, being too hot at home or in the office was an issue as well.

<b>Table 9</b>	
<b>Summer at home/work</b>	<b>All %</b>
Being more sociable	50.00
Noise from open windows	41.55
Being too hot	38.03
Being in the park	34.51
Wearing less	34.51
Feeling thirsty	33.80
Smell of summer air	29.58
Warm evening breeze	29.58
Sun tans	27.46
Barbeques	25.35



Interestingly, it was the men in our sample who emphasised the sociability of summer at home more than the women, who tended to be concerned more with noise from open windows, as we can see from Table 10. Females, however, placed more stress on the open air and the parks than did males. Perhaps the men were imagining being with their mates in the pub garden when they selected the ‘more sociable’ element.

<b>Table 10</b>			
<b>Summer at home/work</b>	<b>Males</b>		<b>Females</b>
Being more sociable	57.38	Noise from open windows	54.17
Being too hot	42.62	Being more sociable	50.00
Feeling thirsty	39.34	Being in the park	38.89
Warm evening breeze	37.70	Being too hot	38.89
Wearing less	36.07	Wearing less	37.50
Sun tans	34.43	Smell of summer air	36.11
Being in the park	34.43	Feeling thirsty	33.33
Noise from open windows	32.79	Salads	29.17
Barbeques	32.79	Chimes of Ice cream vans	27.78
Hangovers	27.87	Warm evening breeze	26.39

### **Multi-dimensional senses of summer**

What is clear from this part of the study is that our sense of summer is very much dependent on the particular contexts that we focus on. Even ‘summer in general’ has two interesting facets to it. And the meaning of summer changes quite markedly from the heat of foreign holidays to the sociability of being at home or away on trips in Britain. All of this, of course, is what we might describe as ‘being on the surface’. It relies on people’s reported perceptions and their verbal descriptions of their associations with the summer months. What was really going on inside their heads when they thought of summer? Could we identify the sensations that thoughts of summer aroused at a deeper level? This was the final task in our study.

## Summer and the brain

All of our moods and psychological states arise directly from activities in the central nervous system (CNS) – the brain and the spinal cord – and have specific effects on the peripheral nervous system – the nerves connecting the CNS to other parts of the body and to the autonomic nervous system, which regulates basic functions such as heart rate, respiration, digestion, etc. It is this last part of the system that plays a central role in emotion

The brain itself contains billions of specialised cells called neurons which transmit signals to each other across the tiny gaps between them by releasing special chemicals known as neurotransmitters. There are many types of neurotransmitter, including acetylcholine, noradrenaline and the impressive sounding gamma-aminobutyric acid (GABA). Many people will also be familiar with endorphins, the chemicals which are released during strenuous exercise and result in a highly pleasurable ‘buzz’, as devotees of aerobics will testify. Endorphins are also released during orgasm, which helps to explain the very positive experience of that event. The two neurotransmitters which concern us most here, however, are serotonin and dopamine – both very much related to mood states.

Serotonin and dopamine are both thought to be implicated in a condition known as Seasonal Affective Disorder (SAD) – an extreme version of the more common ‘winter blues’ that many of us suffer from. About three quarters of SAD sufferers are women and the symptoms include depression, lack of energy, increased need for sleep, a craving for sweet foods and, consequently, weight gain. The lack of sunlight during the winter months, which reduces the levels of dopamine and serotonin in the brain, is thought to be responsible for the condition. (One form of treatment for SAD is a light box which emits intense illumination and is often switched on in the morning to simulate dawn).

The arrival of summer light helps the brain to generate more of the relevant neurotransmitters, and serotonin in particular. As a result, our moods change

as the days lengthen. We become, as we have seen from the responses of our participants, more optimistic, sociable, relaxed, healthy and free – as good a definition of ‘happy’ as we will find.

We noted earlier that many of our participants felt that while summer made them feel more relaxed, it also aroused their senses – more smells and sounds around them, more energy and motivation. These psychological states may seem a little contradictory – how can you be both relaxed and aroused by things around you at the same time? In fact it is quite possible to experience both in this way, and relaxation can often be an aid to concentration.

To explore this a little further we selected a dozen of our participants to be wired up to a multi-channel neurophysiological feedback device. We could not measure levels of serotonin and other neurotransmitters in the brain directly without tapping off some cerebrospinal fluid and subjecting it to a complex analysis. And we were unlikely to get many volunteers for that! Activity within the brain, however, and its effects on the autonomic nervous system (things like heart rate, blood pressure, sweating, etc.) can be measured indirectly quite easily using fairly standard equipment.

The action of neurotransmitters, enabling signals to pass between neurons in the brain along complex pathways, trigger tiny electrical discharges which can be measured on the surface of the scalp. By examining the frequency of these discharges we can infer what is going on inside the head – e.g. levels of relaxation, wakefulness, concentration and mental activity, or whether the subject has fallen asleep.

These ‘brainwaves’ fall into a number of frequency bands. The lowest frequencies, known as Delta and Theta waves, are usually seen most when fast asleep or becoming drowsy, and are of little relevance in this context. At the other end of the spectrum, however, are Beta waves, associated with intense mental activity, and Alpha waves. Alpha waves are associated with states of relaxed wakefulness and are the most relevant to our study of the sense of summer. They are generated in an area deep inside the brain known as the

hypothalamus – the area that also communicates with the autonomic nervous system.

Being able to measure levels of Alpha, and display the results on a computer screen, opens up some fascinating possibilities. At the Social Issues Research Centre, for example, we occasionally use this facility on ourselves to practice relaxation techniques – a kind of modern-day transcendental meditation, but without all the mystique. Using the computer’s sound card the levels of Alpha waves can be associated with musical notes, providing feedback on how relaxed, or ‘effortlessly alert’ we are. After a little practice we can get the notes to rise, indicating that we are becoming more relaxed, and eventually achieve a very pleasant, ‘chilled out’ state of mind.

In our study, brain waves were detected and the various frequency bands identified using two channels of the feedback device acting as an electroencephalogram (EEG). Two electrodes were attached to top of the subject’s forehead over the frontal lobes of the brain (See Figure 2).

Figure 2. Placement of EEG electrodes



Measures of autonomic nervous system activity relevant to the study were obtained using the remaining channels on the feedback device. Galvanic Skin Response (GSR) measures electrical conductance in the skin via two electrodes attached to the subject’s fingers (see Figure 3). This provides a very reliable guide to levels of physiological arousal associated with anxiety. When

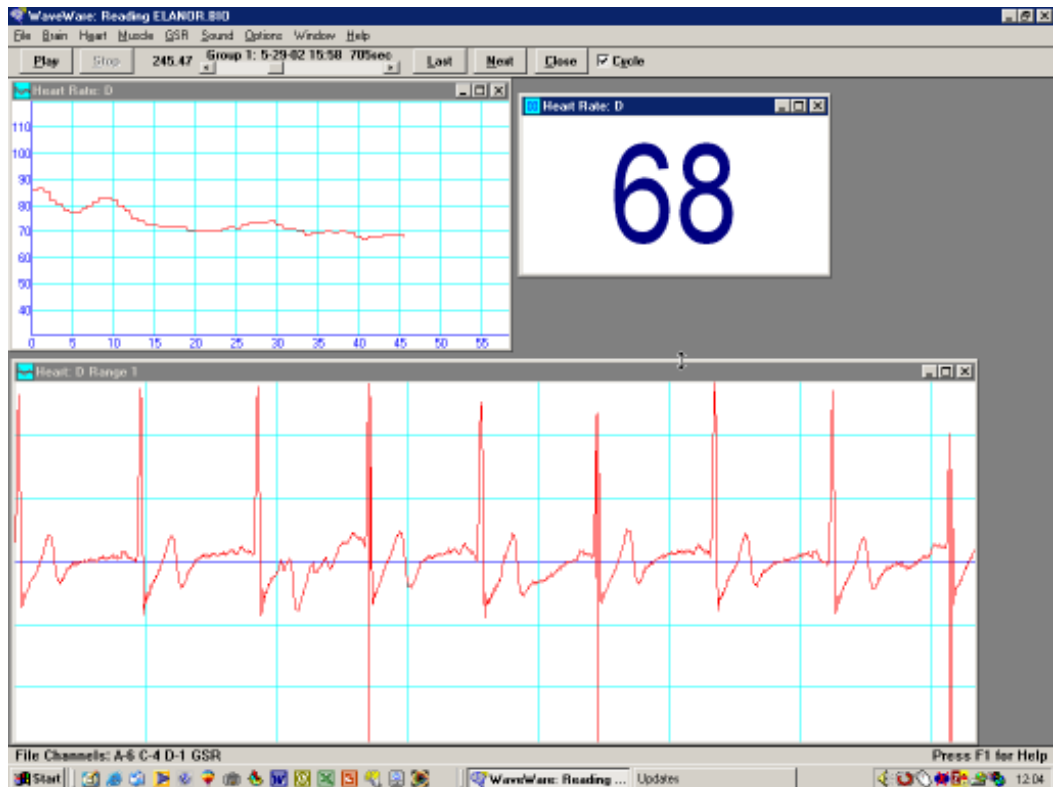
we get anxious or ‘uptight’ the pores of the skin secrete tiny amounts of sweat, reducing the skin’s electrical resistance and increasing conductance. The old-fashioned, and largely discredited, ‘lie detector’ was just a GSR recorder. The problem with it, of course, was that the best liars were the ones who could control their anxiety – lying through their teeth with barely any increase in GSR.

Figure 3. GSR electrodes



Heart rate is another good indicator of the level of tension and arousal we are experiencing and can be measured by attaching electrodes to the chest, or to the lower part of the rib cage in the case of female subjects, providing us with an electrocardiogram (ECG) and a direct indicator of heart rate (see Figure 4).

Figure 4 Typical recording from electrodes monitoring heart beat



The final measure was of electrical activity in a suitable muscle (usually on the subject's back). This provided us with an electromyograph (EMG) and a further indication of levels of relaxation. As we relax, muscle tension, and the electrical activity associated with it, decreases. There are odd spikes of electrical discharge if subjects shift position in their chair, but we can discount these.

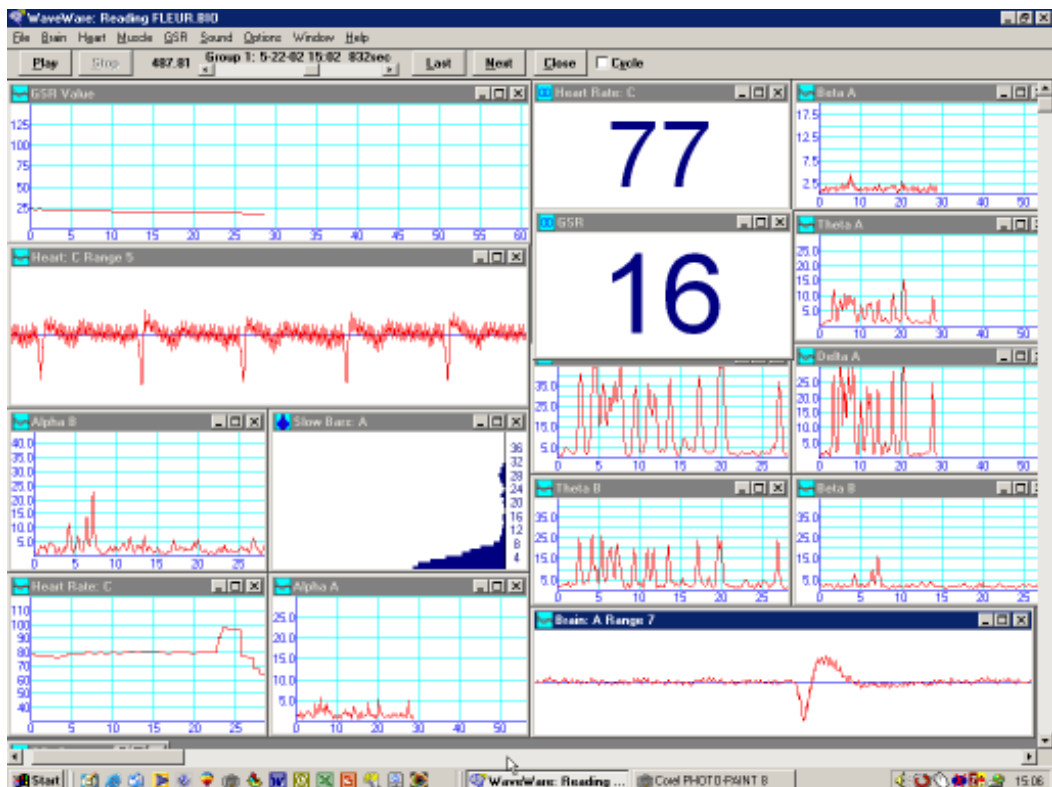
All of this feedback measuring may sound quite complicated, but in reality it is quite straightforward. Once all of the electrodes are attached, using a kind of conductive 'glue' or tapes, the appearance of the 'victim' is like that shown in Figure 5.

Figure 5. A fully wired subject



After the subjects had been given time to overcome the novelty of being wired up in this way, which can produce its own artificial levels of anxiety and arousal, a series of slides relating to aspects of summer was presented on a computer screen, while a separate computer out of sight of the subject recorded all of the neurophysiological data.

Figure 6 Typical recording of 5 channels of neurophysiological data



## Results

We knew from the earlier parts of the study that people vary quite considerably in the sensations and moods that they associate with summer. While we have much in common with each other, our ‘catalogues’ of the senses of summer are very individual. Would we find similar variation in the way subjects responded to images of summer presented to them in this part of the study? Would we see increased relaxation as pictures of flowers, birds and skies were shown, along with the sounds of wave lapping on a beach? Or would we see evidence of the invigorating aspects of summer – the increased levels of social motivation and the sense of ‘feeling alive’ that featured so strongly in our interviews and focus groups?

In fact, we found both, confirming that what people said about summer was also reflected in their brain and body responses.

The first few slides presented were of flowers, punting and a blackbird, complete with sound effects. During the presentation of these there was a general increase in Alpha waves and parallel reductions in GSR, heart rate and muscle tension in most of our subjects. These aspects of summer were clearly relaxing.

Figure 7. Relaxing images of summer



Then we presented our subjects with some of the more ‘active’ images of summer – a noisy swimming pool, a tennis match and an open-air pop festival. In response to these the graphs changed markedly. The levels of Alpha waves declined and heart rate increased. Changes in



muscle tension and GSR showed no consistent pattern, indicating increased psychological and physiological arousal, but no particular increase in anxiety – except in the case of one subject whose GSR leapt up dramatically at the sight of the pop festival. We never did discover why the thought of such an event instilled such anxieties in her.

Figure 8. Stimulating images of summer



After a few slides of a bowl of strawberries, a sunny beach and gentle waves breaking on the sand most subjects were generally back to that ‘effortlessly alert’, relaxed state that even a slide of a roller coaster ride, complete with sound effects, did little to upset. A picture of a garden party and lovers sitting in a meadow put back some arousal in around half of the subjects, while the others were relatively unmoved. And then came a close-up of a spider, sausages sizzling on a barbeque and a buzzing wasp.

While the image of the spider’s head sent some subjects’ hearts racing, accompanied by levels of anxiety that sent the GSR graph off the top of the screen, some stayed quite relaxed – saying afterwards that it looked ‘quite sweet’. But the sausages and wasp tended to make most subjects leave their relaxed states quite quickly. (We discounted one subject’s very adverse responses to the sausages when we found out later that she was a strict vegetarian).

The remaining slides, out of a total of 21, evoked less consistent and reliable results. This was due mainly to the fact that while arousal and

anxiety can be instilled in people quite quickly, it takes rather longer for relaxation, of both brain and bodily states, to occur. Nonetheless, the picture of a blue sky with a couple of wispy clouds did have some settling effect, while a sunburned back had generally the opposite. The final slide – that of a lawn mower with sound effects – produced some very odd responses, with some subjects getting surprisingly excited by it.

We do not pretend that this part of the study was definitive science. To do this properly we would need far more subjects, a much wider range of stimulus materials and a more controlled environment. Even so, it is quite clear from this ‘mini-study’ that different aspects of summer evoke very different responses in our brains. These, in turn, lead to other significant changes in our bodies – changes of which we are rarely conscious but which have a profound effect on our moods and psychological states. The data confirm the fact that summer is far from one-dimensional – it is a complex set of both relaxing and invigorating experiences. And that, perhaps, is why we love it so much.