The 2030 Future of Sleep Report

Jake, aged 37
Business trip
Away from young family
Need to monitor stress and improve health
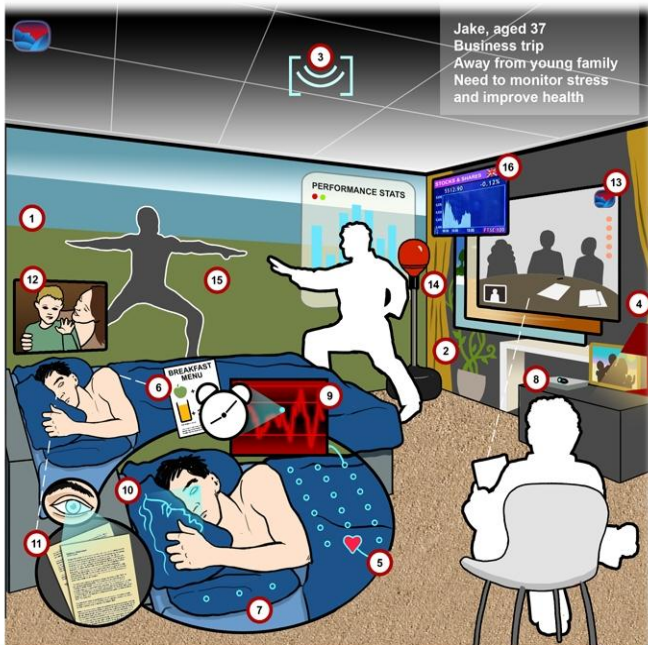
1	Interactive video panels cover full wall space	5	Medical sleep monitoring linked to bed sensors	9	Optimum sleep-cycle alarm	13	Virtual office and multi-way conferencing
2	Home from home upload: 3D room re-skin	6	Dietary advice from night time monitoring	10	Personal link-up: 'Pillow Talk'	14	In-room augmented reality fitness interfaces
3	3D audio effects, digital room sound-proofing	7	Auto-massage de-stress pillows	11	Dream learning: speech revision	15	Interactive gaming and fitness
4	Virtual lighting selection from users home upload	8	Uploads/downloads through digital jewellery	12	Video calls to family	16	Online ordering and purchasing

Hayley
Aged 30
Leisure break with friends
Away from boyfriend
Need to unwind and relax
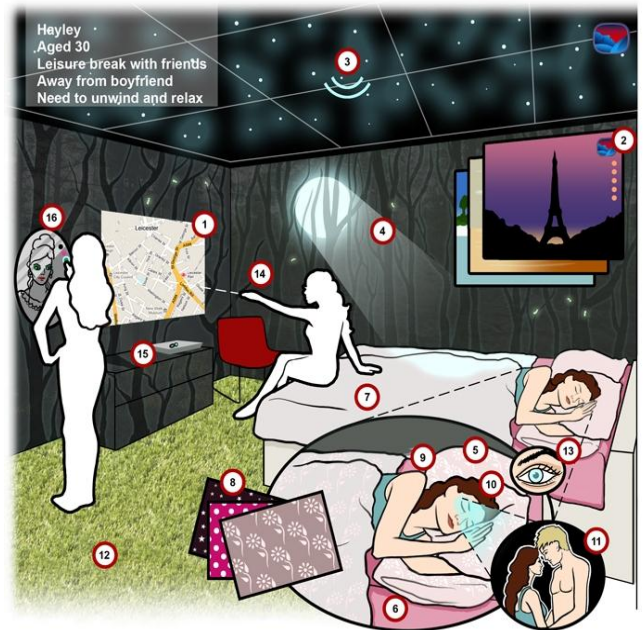
1	Interactive video panels: virtual city tours	5	Aromatherapy fabrics	9	Optimum sleep-cycle alarm	13	Active contact lens
2	Virtual environment: menu choices	6	Temperature control bedding via infra-red	10	Personal link-up: 'Pillow Talk'	14	Gesture navigation
3	3D audio effects	7	Auto-massage de-stress mattress	11	Dream link-up	15	Digital jewellery: recharge, up or download
4	Lighting selection	8	Intelligent textile patterns via light emitting yarns	12	Floor projection	16	Virtual Mirror

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Dr Ian Pearson

Futurologist Ian Pearson is a Maths and Physics graduate and has worked in numerous branches of engineering, from aeronautics to cybernetics, sustainable transport to electronic cosmetics.

His inventions include text messaging and the active contact lens. He was BT's full-time futurologist from 1991 to 2007 and now writes, lectures and consults globally on all aspects of the technology-driven future.

He is a Chartered Fellow of the British Computer Society, the World Academy of Art and Science, the Royal Society of Arts, the Institute of Nanotechnology and the World Innovation Foundation.

In 2007 he was awarded a Doctor of Science degree by the University of Westminster. He was recently awarded an Award for Excellence by the US Army.

"Anyone can predict stuff, but only a few get it right"
Dr Ian Pearson

1. INTRODUCTION

In this independent report, commissioned by Travelodge, Futurologist Ian Pearson investigates the experience of sleep in the future – year 2035.

As a 'retailer of sleep', this report is part of Travelodge's focus on how to best provide a good night's sleep for guests, both now and in the future.

Sleep is becoming a valuable commodity in today's fast- paced technical society.
The stresses associated with 21st century living are affecting our sleep and having a negative impact on our health, work performance and our relationships.

Therefore serious consideration needs to be given to the value of sleep and it is vital to investigate now how sleep will be affected in the future.

2. EXECUTIVE SUMMARY

We are living in an increasingly 'tired' society – whereby every year we need the same amount of sleep and every year we get less. In the future, in 2035, sleep will still occupy a third of our lives. Technology will not change our basic need to sleep but the way in which we satisfy our appetite for slumber will change markedly.

From recreation and training to medical monitoring, a good night's sleep will have important consequences on health and our general well-being.

When we need to stay in hotels in 2035, we will still want a good night's sleep in comfortable surroundings. The key difference is that our experience will be personalised to our individual needs and taste via virtually invisible technology. This technology will monitor and anticipate our physical, emotional and mental needs and desires for a healthier and happier state of being.

Almost any surface or fabric in the room will be capable of electronic enhancement whether it is scent production, monitoring our health or acting as a visual display or speaker.   By monitoring guests unobtrusively throughout the night, the room will protect its occupiers from disturbance using anti-noise and ambient audio. An adaptive mattress and electronic fabrics will optimise guests' rest period whilst the dream management system will ensure guests have the right dreams and wake feeling refreshed at the best possible time - when their sleep cycle is completed.

It is often harder to sleep when away from home. The 2035 hotel room will improve sleep quality by emulating the home environment or even directly relaying it, so that individuals feel they are actually at home in bed with their partner.

The following report is divided into two sections:

1. **Sleep management in 2035**
2. **Features of the 2035 hotel room**

Part One: SLEEP MANAGEMENT IN 2035

SLEEP AIDS & INDUCTION TECHNOLOGY
Counting sheep replaced by sounds and electro-magnetic (EM) fields

Much of our sleep will be unaffected by technology in 2035 and insomnia will still be a problem. However, the use of sleep induction aids based on sounds and EM fields will be widespread.

Individuals will be able to wear active lenses so that they can watch TV or check emails – whilst their eyes are closed as they drift asleep.

Active lenses will deliver high quality 3d images directly onto the retina, as they are worn under the eyelids. They may be used to substitute any kind of display used today.

In addition, sleep-cycle alarms will monitor the electrical activity in the brain and identify the best time to wake the sleeper – so that the individual will wake up fresher than if they had awoken a few minutes in the middle of a new sleep cycle.

SLEEPWEAR

Developments in fabric technology and synthetic materials mean sleepwear of the future will feature electronically controllable properties such as touch sensitivity, shape changing, thermal properties and light emission. Using yarns that contract under electronic field, clothes could gently massage sleepers or play active roles in dreams, linking with imagery and sounds to create a fully tactile dreamscape.

Fibres that emit infra-red radiation could also warm sleepers rather like an electric blanket, or perhaps instead creating the illusion of sunshine on a beach during dream-play. Thermal properties in sleepwear would also allow sleepwear to adapt to room temperature to help keep a stable temperature for the wearer.

Nightwear made from light emitting yarns would also provide a display facility which could interact with other media channels such as: TV, radio, web based media, games or via signals from the individual's body.

DREAMS
Sweet dreams with dream games, recording and replay

Today we have no choice over the content of our dreams, but in 2035 we will able to manage our dreams. Orchestrated dreams will form an important part of sleep, and video, audio, smells, and tactile experiences produced using the bed or bed linen will play a key role in the sleeper's dreams. A dream menu will be available for sleepers to choose their favourite dream.

Dream linking to other people will be possible – so if a friend is dreaming at the same time, it may be possible to communicate with them via your dream. Sleepers will also be able to play games in their sleep using feedback from image recognition and emotion detection.

In the future, dreams could be recorded and played back at any time with the aid of brain monitoring. Partly recorded dreams will enable sleepers to pick-up a dream from where they left off and continue the dream journey or re-experience it again.

Sleepers who use augmented reality and sleep with active contact lenses will potentially experience a high quality dream.

Using other information such as skin conductivity (measured by sensors in sleepwear or pillow fabrics), it will also be feasible to detect whether a dream is a nightmare. If the dream is a nightmare and it causing distress, the sleeper can use a nightmare alert alarm to wake them up.

It will also be possible to link alarms clocks to our dreams. The alarm would work in synch with individual's sleep cycles - so that they could delay awakening the sleeper until the dream finished or before a new dream started.

IMAKING LOVE
Virtual love-making for lonely travellers

Augmented reality will play a major role in love making. Remote presence via augmented reality will allow people to effectively make love to their regular partner whilst away from home. The in-bed technology will allow people to feel as if they are in their own bedroom and with the aid of virtual reality they will experience spending the night together with their partner.

People will not just be able to change the appearance of their room; they will also be able to adjust how their partner looks whilst making love - by using active lenses to change the image delivered to their retinas. This will enable people to change the image of their partner, on a regular basis and only they will be aware - as their lover will not be able to tell if they have selected a different visual person.

Couples will also be able to benefit from the ability to link peripheral nervous systems via active skin electronics together for enhanced love making. This will enable both individuals to experience each other's feelings and emotions.

MEDICAL MONITORING
Doctor's diagnosis as you doze

By 2035, it will be possible to diagnose some medical conditions by monitoring sleep patterns. Sleepwear featuring electro-responsive fabrics will enable measurement of skin conductivity (indicating stress or relaxation states), pulse, blood pressure, the quality of heart signals and transmission of light through the skin, which could be used to measure blood make up, for diabetes monitoring for example. Simple microphones of the kind used in i-phones could also be used to monitor heart rate.

Alarms could be linked to the monitors too, waking the sleeper if need be, rather than allow a condition to reach a dangerous situation.

Individuals will be able to upload medical programmes designed by their doctors so that they can be monitored at all times – including when they are sleeping.

EDUCATION & TRAINING
Studying as you asleep

The benefits of sleep-time learning will be more widely known in 2035. We will be able to use the dream management system as our own external coach, delivering training programmes or giving sleepers the opportunity to learn and practice useful life skills whilst asleep.

Sleepers will be able to learn a new language whilst falling a sleep or study towards a qualification or learn a new skill.

Part two: FEATURES OF THE 2035 HOTEL ROOM

IN-ROOM TECHNOLOGY
Create your own room with augmented and virtual reality

A hotel room generally comprises of hard and soft surfaces and in 2035 these surfaces will have a personalised dual function.

Hard surfaces such as the walls and desk top areas will be used as displays, speakers and work surfaces. For example you will be able to use the hotel room wall for work conference calls / meetings, display virtual family images, shop online or watch movies.

Soft surfaces such as fabrics will interact in tactile ways to produce scents, change colours and pick up signals from the skin. For example guests will be able to instantly change the colour, pattern and texture of their room furnishings.

Atmospheric temperature control air conditioning will allow guests to alter their room climate so that they can stimulate the ambience of a seaside, forest, or being in the mountains ambience in their room.

Cyberspace will play a huge role in the 2035 hotel room where guests can invite digital creatures, plants or characters from virtual environments, movies and games to share their room with them.

Augmented and virtual reality will play a big role in hotel rooms by 2035. Augmented reality is the use of computer imagery overlaid on the field of view to augment the reality that the user sees. Computer generated data can be superimposed on the field of view, making the interior of a room appear like the guest's own bedroom at home, or representing any appearance desired. The whole volume of the room with the entire surface of the walls and furniture will be used as an interactive display. Augmented reality could use a variety of displays, such as wallpaper, goggles or active contact lenses.

The walls of the room will be papered with e-ink based wallpaper, allowing any imagery to be used. Or the space could be a major lighting contributor. This means that any region of the wall could become any kind of display e.g. a painting, a computer screen, a TV screen, an electronic mirror, a videoconferencing screen, a virtual window into a fantasy location, a fish tank, or even just wallpaper. Guests would be able to choose from a range of layouts or impose their own room, by uploading a picture of their home bedroom - the hotel room would visually replicate it, within the physical limitations of the space.

The room's virtual windows will look out onto any scene the guest desires, such as a beach, their favourite city, a football pitch, a forest or their own back garden. With virtual windows, time zones appropriate to the traveller's home time zone will be replicated with lighting coming directly from the window – rather than the room.

To further enhance the room experience, guests will be able to choose a range of outdoor sounds from flat panel audio built into the window. For example a guest who chooses a beach window scene will be able to add the sound of the ocean so that they will feel like they have a sea view room at a tropical beach. Alternatively if a guest chooses to overlook a forest they could opt for outdoor rural sounds.

Also if ambient sound is being used to create an illusion of a forest, then the illusion could be enhanced by the addition of virtual animals and plants in the room itself, rather than just outside a virtual window. The room could become like a forest lodge, or even an outside bed in an enchanted forest, where guests could sleep under the star and listen to night creatures as they fall asleep. Or, just as easily, they could fall asleep while playing in a game–like environment populated by zombies or aliens, though this might not be quite so relaxing of course.

With this kind of technology, the hotel room will essentially be a plain box with only the essential furniture added. All the décor and ornamentation would be accomplished electronically.

Even virtual luxury may be created. A plain room could appear more luxuriant at the flick of a switch with themed settings. This would allow hotels to provide an illusion of greater luxury than is actually present, increasing the perceived value of the room. It would also allow a lot more personalisation of the customer relationship.

This technology will also enable business travellers to turn their hotel room into a working office. The desk area would become active and talk to the guest's communication devices, charge them up, and act as a smart extended interface. The hotel room wall would become a video monitor with webcam capability, just as easily as a high definition video display for movies. A guest would easily be able to hold virtual meetings in the room using augmented reality overlays.

Guests will be able to shop from the room, with the walls replicating the interior of a shop. Browsing shops in this way will be commonplace in the future, as augmented reality encourages companies to offer attractive combinations of web and physical shopping in the same space.

In the same way guests could enter into the world of computer games and play the actual character – within the dimensions of their room. Individuals would be able to link up with other guests and play virtual reality games between rooms.
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In addition, guests could attend a local theatrical production, explore some local tourist attractions or just wander through town, all remotely. They would be able to do any time regardless of the actual time or weather.

In room technology will allow guests to operate all equipment with a combination of voice, gesture, use of virtual keyboards and thought. Today, we take mobile phones for granted but in 2035 they will be extinct. Instead we will be using tiny items of digital jewellery for our mobile and IT requirements. People will be able to select any form of jewellery which will connect to the net and services will be provided virtually. Fingertip tracking will replace keyboards and active contact lenses will enable users to read messages and view movies in 3D high resolution. This will be possible via tiny lasers and micro-mirrors which will project any kind of imagery right onto the retina - and because they lie under the eyelid, you will be still be able to view images with your eyes shut.

With this technology there will be little need for physical displays such as TV's, monitors and iPads.

THE BED & BED LINEN
King-size technology

The mattress of 2035 will look and feel superficially the same as today but will be bursting with advanced technology. Shape memory alloy springs and microtubules running through the foam will allow the mattress to become firmer or softer as required. In addition electro-polymers embedded in the mattress will provide a massage feature for sleepers.

Mattress covers, sheets, bed covers, pillowcases and sleep suits will be made from fabric that will change colour, have thermal properties and release gentle scents. Fabrics will be able to change colour by using pigments that change according to temperature or electrical fields.

Fabrics will also release scents by picking up electrical properties of the skin that indicate emotional states such as stress and aid relaxation.

Also, electro-responsive fabrics will be used to help de-tress sleepers so that they can obtain a good night's sleep. The electro - responsive fabric will also be linked to an alarm for people

who suffer from a medical condition - so that they can sleep safely knowing if their condition should worsen during the night they will be alerted and awoken from slumber.

Sheets could even incorporate optical fibre technology that would deliver infrared radiation treatment to the body as required.

The 2035 pillow will be more than a soft cushion to rest your head - the pillow of the future will be bursting with advanced technology. A typical pillow will house a range of soft electronics which will provide the following features:

- Detect brain, REM and sleep activity
- Create sound to help aid sleep,
- Provide a head and neck massage
- Have a microphones to allow people to chat as they fall asleep
- Have scalp electrodes to enable sharing dreams with partners and friends

MIRRORS
Get a new look just by looking in the mirror

Electronic mirrors will have a useful role in a future bedroom or bathroom. An ordinary mirror shows a reflection of you as you are, but an electronic mirror will offer a choice of simple reflection or an alternative 'right way round' image. It could even show a woman what she would look like after she has done her makeup.

Mirrors of the future will also help women and men to put on their daily make-up. Individuals will just need to spread the make-up on their face and the electronic control system would instruct the particles to align to create the image shown on the mirror or on the make-up tube.

Virtual Hotel Staff

Hotels will use toys and robots to communicate with guests. A cuddly web linked voice recognition teddy bear will be able to act on behalf of hotel staff by chatting to guests, providing a cuddly wake-up call or just wander around the hotel being cute.

Robots will be used to clean hotel rooms, transport luggage and carry out general room service duties.

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