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HOW PEOPLE MAKE MONEY FROM IDEAS

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INTRODUCTION: THE ART OF THE PATENT

NEWS FROM THE FRONT

In 1997 America produced $414 billion worth of books, films, music, TV programmes and other copyright products. Copyright became America's number one export, outselling clothes, chemicals, cars, computers and planes. *Fortune* magazine calculated that basketball player Michael Jordan's personal economic value, mostly gained through copyrights and merchandising, exceeded the Kingdom of Jordan's gross national product.

In 1998 theatres in the West End and Broadway spent over three times as much on intellectual property as on the bricks-and-mortar kind. In the West End, theatre owners spent £26 million a year on copyright royalties and only £8 million a year on their buildings. Britain's music industry employed more people and made more money than did its car, steel or textile industries.

In 1999, Telecom, the world's biggest communications fair, held in Geneva every four years, attracted so many people that the Swiss Tourist board was obliged to open the city's nuclear shelters for emergency accommodation. The charge was Sw Fr 25 per night including taxes and service (the service, I was told, was minimal). Over 190,000 people wanted to see the latest developments in media, communications and the Internet.

Also in 1999, the US Patent and Trademark Office issued a record number of 169,000 patents. As well as patenting the usual mechanical inventions and gadgets, it gave patents for business methods (which raised some eyebrows). It gave Dell Computers a patent not for the computers it sold but for the *way* it sold them. It gave Amazon.com a

patent for the way people ordered its books and CDs. The Amazon patent contains this phrase: 'Modifications within the spirit of the invention will be apparent to those skilled in the art.' The appeal to a person 'skilled in the art' is a standard tactic in patenting worldwide, and allows a patent to cover more than its current, actual application. I call this the 'art of the patent'.

During the same year, the British Patent Office awarded a patent for the technique of cloning Dolly, a sheep. The patent covers the 'possible use of the technology in cloning human cells'. In Norfolk, a housewife was reprimanded and given a legal notice when she propagated a plant bought at her local garden centre and tried to sell the cuttings. She and her parents have been propagating plants for generations, but new rules made her gardening habits a civil offence.

What is going on?

A NEW ECONOMY

These diverse activities have one thing in common. They are the results of individuals exercising their imagination and exploiting (or preventing others from exploiting) its economic value.

This book is about the relationship between creativity and economics. Creativity is not new and neither is economics, but what is new is the nature and extent of the relationship between them, and how they combine to create extraordinary value and wealth.

There has been a rapid spread of patents, copyright and trademarks. Intellectual property used to be an arcane and boring subject, something for specialists only, but within the past few years it has become a powerful influence on the way everyone has ideas and owns them, as well as on global economic output. Accountants Arthur Andersen say 'electronics, software, health-care, consumer goods, telecommunications, media and entertainment are substantially dependent upon intellectual property'; I would add biology, agriculture and education. When I look at some countries' patenting policies, I am inclined to add everything else.

When he was arguing the case for America's first federal copyright law, President George Washington said it would increase the stock of

knowledge, and 'knowledge in every country is the surest basis of public happiness'. Nowadays, a US president would be more likely to say it is the surest basis of business competition.

People with ideas – people who *own* ideas – have become more powerful than people who work machines and, in many cases, more powerful than the people who *own* machines. Yet the relationship between creativity and economics remains almost invisible. I decided to see if I could bring together all these elements – creativity, intellectual property, management, capital, wealth – into a single comprehensive framework. This book is the result.

First, some definitions. *Creativity* is the ability to generate something new. It means the production by one or more people of ideas and inventions that are personal, original and meaningful. It is a talent, an aptitude. It occurs whenever a person says, does or makes something that is new, either in the sense of 'something from nothing' or in the sense of giving a new character to something. Creativity occurs whether or not this process leads anywhere; it is present both in the thought and in the action. It is present when we dream of paradise; when we design our garden; and when we start planting. We are being creative when we write something, whether it is published or not; or invent something, whether it is used or not. I use the word *creator* to describe any person who creates or invents something new.

We are all creative in our own way; in how we perceive and present ourselves to the world; in how we make sense of the world. Our sparks of creativity inform our personality. A few people go further and make their creative imaginings the core of their working life; not only in terms of their personality but commercially, in how they make a living and a profit.

An *economy* is conventionally defined as a system for the production, exchange and consumption of goods and services. Economics generally deals with the problem of how individuals and societies satisfy their wants, which are infinite, with resources which are finite; it is thus primarily about the allocation of scarce resources. Although I use both terms in these senses, I show that ideas are not limited in the same way as tangible goods, and the nature of their economy is different.

Creativity is not necessarily an economic activity but may become so when it produces an idea with economic implications or a tradeable product. This transition from the abstract to the practical, from the idea to the product, is hard to define. There is no overarching definition of the moment of change that covers all eventualities. The laws on intellectual property provide one set of criteria and the marketplace provides another. In general, the change occurs whenever an idea is identified, named and made practicable and may, as a result, be owned and traded.

The result is a *creative product* which I define as an economic good or service that results from creativity and has economic value. This book starts with creativity (Chapter 1) and then moves to creative products (Chapters 2 and 3). A creative product may be a good or a service. Traditionally a good has meant something with a physical mass (like a book) and a service has meant something that has no mass (like a broadcast), but lawmakers have not been very successful at fixing these definitions in precise terms and usually resort to the comment, 'If I drop it on my foot and it hurts, then it's a good'. The distinction becomes uncomfortably blurred when a product's economic value is largely dependent upon such intangible concepts as ideas and computer software, and has intangible property rights such as patents, trademarks and designs. The growth of e-commerce adds yet more confusion. For example, a creative product (say, a piece of music) may change category from good to service and back to good again. Throughout, however, the important characteristics of a creative product are twofold: it results from a creative activity and has recognizable economic value.

The output of creative products has tended to happen most publicly and obviously in the arts, which has caused the arts to be seen as the core creative activity and for creativity and the arts to be treated as synonyms (or, at least, creativity and good art). But artists have no monopoly on creativity, nor are they the only workers in the creative economy. The difference between creativity in the arts and elsewhere is not that artists are more creative, or more successfully creative, but that because they deal in a specific range of ideas and aesthetics, they create specific kinds of works and work according to identifiable business models with their own patterns of supply, demand, values and pricing.

Creativity flourishes equally in the sciences, especially in research and development (R & D). There is little difference between the creativity of the scientist and of the artist. Colin Ronan, author of *The Cambridge History of the World's Science*, says 'To engage in science requires a vivid creative imagination, tempered by firm discipline based on a hard core of observational experience.' Biologist Edward O. Wilson, one of the most distinguished scientists of the twentieth century, and the inventor of 'consilience', which he describes as the 'interlocking of causal explanations across different intellectual disciplines', says creativity is 'the ability of the brain to generate novel scenarios and settle on the most effective'. Both arts and sciences are attempting to imagine (to visualize) and describe (to represent) the nature and meaning of reality. Both use the same thinking and creating processes. The difference comes in why they choose to do so, how they present their imagining to the world, and how they protect its economic value. Put simply, the creativity is the same; the creative products are different.

Creativity is present at all levels of business from the management of a company to the development, branding and shape of each product. Few businesses today are the same as they were ten or even five years ago; fewer still will be the same in the next five years. Increasing competition, volatile technology and the arrival of the Internet require all companies to be imaginative in the way they do business and vigilant in protecting their products by means of intellectual property rights.

Creativity is possible in every organization where novelty and invention are possible. It flourishes most when and where they are rewarded.

Many creative products, although not all, qualify as *intellectual property*. Intellectual property has the same defining characteristic as physical property: it belongs to someone. But unlike physical property, which we can see and touch, intellectual property is intangible. It is an artificial construct which did not exist until governments invented it. Governments and the courts still define what it is, and prescribe an owner's *rights*. Intellectual property is therefore not the same as any idea or bit of knowledge that we may happen to have; it is solely what a law says we know or have.

There are several forms of intellectual property, of which the four

most common are copyright, patents, trademarks and designs. Some legal systems also protect trade secrets and confidential information; others, personal secrets and privacy. *Copyright* law covers an individual's creative expression when fixed in specific works. Originally, it was limited to writings in the literary sense but more categories have been added (for example, films and sound recordings), and each category extended to include more activities (for example, the category of literary works now includes computer programs because they are, after all, a skilful and imaginative piece of writing). Copyright accrues automatically to any qualifying work and does not need to be registered. It normally lasts for the author's lifetime plus seventy years.

The second major area, *patent* law, originated in the need to protect inventions of new industrial products and processes. It gives the inventor a monopoly in the making of the new product, typically for twenty years. Patents and copyright are fundamentally different. Whereas copyright accrues automatically, a patent has to pass stringent tests before being approved. It must be novel, non-obvious and useful. None of these tests apply to copyright. Once registered, a patent gives stronger protection than does copyright.

A *trademark* does not require any artistic or creative expression (as does copyright) or any expert skill (as does a patent) but is merely a mark or symbol that represents an organization or trade. I generally restrict the word to cover trademarks that are registered, which means they have to be actively traded and to pass tests of type and uniqueness. A *design* is a shape or symbol that, like a trademark, has the character of being distinctive and unusual. In legal terms, it is something of a hybrid. It often qualifies for copyright; it may also qualify for a special design right (as in Britain); and it is usually registered like a trademark.

These systems can overlap. An artist's working sketch for a trademark qualifies as an artistic work and merits copyright protection quite separately from the trademark itself being registered as a trademark or a design. Computer programs which automatically qualify for copyright may in some countries also be awarded a patent.

The *copyright industries* consist of all industries that create copyright or related works as their primary product: advertising, computer software, design, photography, film, video, performing arts, music (publishing, recording and performing), publishing, radio and TV,

and video games. Art and architecture also qualify as copyright works, but in most cases their rights are marginal to their economic value. Art is mostly valued and sold as a physical object, and new buildings are sold as physical structures, according to the rules of physical property. I follow normal practice by not including them as copyright industries (though I do include them, centrally, as creative industries). The International Intellectual Property Alliance (IIPA) makes a distinction between the 'core' copyright industries listed above, and what it calls the 'total' copyright industries, which also include the manufacturing of products which depend upon copyright goods (for example, computers and TV receivers). I do not include these related industries as copyright industries. The *patent industries* consist of all industries that produce or deal in patents. The dominant ones are pharmaceuticals, electronics, information technology, industrial design, materials, chemicals, engineering, space and vehicles. The dominant activity is scientific research and development which is carried out by commercial companies, technical laboratories and universities. The *trademark* and *design* industries are even more widespread, and their sheer size and diversity make them less distinctive. It is possible to identify the creativity involved in the creation of a trademark, but it is less easy to calculate its economic value or to identify the economic gains attributable to the trademark in the total product mix.

Together, these four industries constitute the *creative industries* and the *creative economy*. This definition is contentious. While all the definitions so far concur with international practice, there is no consensus on this one. Most countries would agree that creativity and its industries embrace the creative imagination in all its forms. But a few, including Britain and Australia, restrict the term 'creative industries' to the arts and cultural industries and exclude science and the patent industries. This is a regrettable extension of the historical tendency to keep the arts and sciences too far apart. Britain confirmed this narrow view when in 1997 the Labour Government set up a Creative Industries Task Force which, although originally including all intellectual property industries, then decided to exclude science. The Task Force was a bold initiative but had the unfortunate side effect of implying science was not creative. The same government's National Endowment for Science, Technology and the Arts (NESTA) takes a wider and more

humanistic view in assuming 'creativity' is present in science, technology and engineering and, indeed, in all 'new and innovative products and services'. In general, though, Britain still uses the word 'creative' to mean something 'artistic' and 'cultural'.

The *intangible industries* is another description of the creative industries in the wider sense. I use this description seldom, because although these industries do deal in intangible values, they also produce a substantial proportion of manufactured products which are highly tangible. The people who print books and build theatre sets are as much a part of the creative economy as those who write and perform on stage.

The *creative economy* consists of the transactions in these creative products. Each transaction may have two complementary values: the value of the intangible, intellectual property and the value of the physical carrier or platform (if any). In some industries, such as digital software, the intellectual property value is higher. In others, such as art, the unit cost of the physical object is higher.

We are creative animals, *homo creator*, but our creativity does not always lead to a creative product. The *creative equation* deals only in creative products, not creativity, and differentiates between a creative product and a transaction. It states that the creative economy (CE) is equivalent to the value of creative products (CP) multiplied by the number of transactions (T); that is, CE = CP x T. Creativity itself cannot be quantified. We can say someone is more creative, even very creative, but we cannot say he is two-and-a-half times as creative. The number of creative products can be quantified, but the multiplicity of products and the confidentiality of many deals may inhibit us from making a completely accurate count.

UP THE LADDER OF DESIRES

There are powerful reasons why the creative economy will be the dominant economic form in the twenty-first century. The first and most compelling is the way we evolve as physical and social beings. The great American psychologist Abraham Maslow suggested our needs ascend up a hierarchy from the physical to the emotional and

spiritual (a path described by scientist Jacob Bronowski as 'the ascent of man'). Our first needs are air, water and food; then, when these are satisfied and if the environment is hostile, for shelter and safety. Next come our social needs for belonging, our 'ego' needs for love and attention, and finally our need for personal growth and intellectual exploration. As each need is satisfied, so people become more conscious and desirous of the next one up. As they satisfy their physical needs, so some seek emotional pleasure and a few seek intellectual satisfaction. Andrew Curry of the Henley Centre in London says consumer needs in OECD (i.e., industrialized) countries have changed noticeably in recent decades from functional and practical matters to having a sense of well-being and personal fulfilment. In 1998 over 50 per cent of consumer expenditure went on 'lifestyle' and 'fun'. Paul Saffo of the Institute of the Future, California, says there is a hierarchy of consumer desires with entertainment at the top. We should not be surprised if people, whose material needs are largely satisfied and who have a high level of disposal income, remix their ambitions and put a premium on matters of the mind.

We should also not be surprised if a market evolves to meet these needs. Several different processes are under way. On the supply side, automation in the manufacturing industries and, to a smaller extent, in the service industries has cut the demand for manual labour, so young people are looking elsewhere for work. Many turn to the creative industries, which may offer an attractive lifestyle and above-average economic rewards. New industries have arisen around the new communication technologies, each with its urgent needs for skills and ideas. The cultural industries are becoming more commercial and more competitive (not always to their liking). Market economies are skilful at meeting consumer needs, especially in the field of entertainment, where consumer needs are so passionate and evanescent. Suppliers have become adept at charging for pleasure.

On the demand side, economic output continues to grow, leading to a growth in spending power; an increase in leisure budgets; and an increasing focus on leisure activities. The British, Americans and Japanese spend more on entertaining themselves than on clothing or health-care (and most clothes are chosen as much for pleasure as for utility). The British and Americans spend respectively about 17 per

cent and 20 per cent of total consumer expenditure on pleasure, more than on housing or food.

As a result, the creative economy is growing faster and faster. Its annual growth in the OECD countries through the 1990s was twice that of the service industries overall and four times that of manufacturing overall. Between 1987 and 1997 the American copyright industries increased their output at the rate of 5.8 per cent a year compared to 2.8 per cent a year for other industries, and increased the number of jobs at 4.0 per cent a year compared to 1.6 per cent in the ordinary economy. The number of American patents for inventions almost doubled from 89,000 in 1977 to 169,000 in 1999. The number of European patents rose more slowly but the trend was still upward.

These products can now be distributed worldwide to ever larger audiences. The most marked growth is not actually in the creation of new products (although their number is growing remarkably) but in their exploitation, distribution and trade. The creative economy has been midwived by the technologies of information and communications. The new digital technologies have created new opportunities for content; a universe of cyberspace, of synthetic 3-D imaging and discourse, hungry for text, images and stories. The low costs of digital technology allow people to make, distribute and exchange their own material alongside, and increasingly penetrating throughout, the larger corporate markets.

Content creators have always dealt with middlemen. Now a new kind of operator has emerged who not only becomes involved in the production and distribution of each product (its volume, its price) but also creates new kinds of content and new kinds of audiences. On the Internet, these gatekeepers are redefining the concept of 'channel' and 'audience'.

These evident, desirable skills of individual creativity are being copied and borrowed by people and companies throughout society. Perhaps the greatest impact of the creative economy is not only within the traditional creative industries but in the way their skills and business models are being used to create value in other areas of life. The use of the imagination, the management of intellectual capital, the best way to incentivize and reward creative people, the short timescales, the response to success and failure; these skills, which have

only recently got on the agenda of mainstream business, are the stock in trade of the creative person.

Two trends are interwoven. Creative people and organizations are becoming more businesslike; and business is becoming more dependent upon creativity. Both produce more copyrights and register more patents, and often push for privatization of what was public.

This crossover between the creative industries and the conventional economy may explain the conundrum of the above-average growth of the American economy (part of what Peter Schwartz, President of the Global Business Network, calls the 'long boom'). Many expert observers in the late 1990s were perplexed by its apparent contrary nature. Economic theory suggests that a combination of higher demand and higher growth drives up the prices of raw materials and of labour; hence inflation. But the rapid growth in America between 1996 and 2000 did not cause inflation. As output continued to grow above the long-term trend, new jobs continued to be created and inflation remained low.

One possible reason is that the growth in current output depends less on old-style raw materials that are subject to diminishing returns and whose price, if demand increases, also goes up; and increasingly on intangible resources that are, if not infinite, at least indefinitely large. According to this view, the rise in stock-market values, which increased at an even faster rate than underlying output, was caused by individuals' intuitive perception of this change, in advance of theories being developed to explain it.

LEARNING AND DOING

This book is about such basic matters as what we want and what we are good at. Someone who is or has the potential to be creative (and the latter category includes everyone) faces a basic choice which is measured at one end by creativity and at the other by repetition. It is not a division between being artistic and being businesslike, which merely rewrites the kind of duality which scientist and writer C. P. Snow expressed as dividing the 'two cultures' of science and literature. It is between life and death, between thinking and not-thinking,

learning and not-learning, which is applicable to art, science, literature, business – everything.

The next seven chapters describe and analyse this new economy. Chapter 1 explores the nature of creativity. Chapter 2 starts the discussion on creative products with a look at intellectual property; at the 'property contract' between creators and governments which decides what is public and what is private. After these general chapters, Chapter 3 switches tack and gives a statistical analysis of the fifteen core creative industries: from art to video games via the R & D lab. The next two chapters delve further into business and management; and Chapter 6 into digital technologies. Finally, Chapter 7 brings us back full circle, and lays out the arguments for everyone to treat creativity as his or her chief capital asset. Each chapter starts with an interview with someone I met in the course of writing the book who exemplifies the creative spirit. There is no summary chapter beyond this Introduction which you (may) have just read and a few short paragraphs at the end.

1

THE FIRST TALENT

LAW 1: CREATE OR DIE

'That which is creative must create itself.'
John Keats

'If I had to define life in a word, it would be: Life is creation.'
Claude Bernard, nineteenth-century physiologist

THE GRAPHIC ARTIST

Harry Kroto asks to borrow my pen so he can draw something on a paper napkin. As a Nobel laureate in chemistry, he might be about to draw the shape of the C_{60} molecule he and others discovered. The Nobel Foundation, not noted for extravagant praise, described it as 'uniquely beautiful and satisfying'. As his other passion is graphic design, he might be about to draw another logo. It's another logo.

I point out that most of his logos are based on word-play and letter-play rather than abstract shapes. Kroto returns to the napkin to map out the periodic table, in which each chemical element has a letter, and circles three letters, then four; goes back to the logo for his new initiative, the Vega Science Trust; and then draws his new logo for a friend's company called Breakthrough.

C_{60} is a carbon molecule with the unusually large number of sixty atoms; it is much larger than any previously known carbon molecule. Kroto named it buckminsterfullerene, after the designer and inventor Buckminster Fuller, who used a similar structure in his geodesic domes. The essence of C_{60}, apart from its great size, is the symmetrical

combination of pentagons and hexagons which give the molecule outstanding strength and stability.

The story of the discovery of C_{60} illustrates the quirks of the creative spirit. It is a story in every sense of the word: a search, a number of characters, several journeys, a fortuitous discovery ('fortune favours the brave'), celebrations, periods of intervening calm, a climax, a resolution. It started when Kroto, who says he is 'interested in puzzles', in 'following my nose', had a rather far-out idea he wanted to test about molecules in space. He wasn't looking for C_{60} at all.

He suggested an experiment, but it wasn't a priority, and eighteen months passed before the team who eventually shared the Nobel Prize came together: Harry Kroto at Sussex University, and Richard Smalley and Robert Curl at Rice University, Houston. Robert Curl, an expert in spectroscopy, picked up on Kroto's original idea and talked to his colleague, Richard Smalley, who had built the original apparatus. Each worked with their fellow researchers and students. I have a vivid sense of an open community of people who stepped in to help at each stage. Kroto mentions David Walton, who 'started me off in my love affair with carbon', someone else who 'carried out a very important experiment', someone who worked down the corridor and could answer a question. When the experiment finally took place, it supported his theory about the formation of molecules in space but it also showed something else. This, he says, was a complete surprise. Serendipitously, they had discovered evidence of a new large molecule.

There followed a hectic period of about ten days in September 1985 when their speculation on the shape of the molecule turned to conviction. Kroto says C_{60} was born on Wednesday 4 September. They published their claim in *Nature* on 14 November. The responses varied from disbelief to enthusiastic acceptance.

The *Nature* article was an assertion of possibility; a brave and confident claim that the thing existed. Five further years passed before they received spectroscopic verification. Kroto says that the colour of the magenta solution produced by C_{60} in that experiment was 'one of the most beautiful colours I have ever seen'.

The first experiments in 1985 had suggested something large was present but gave no evidence of its shape. Kroto looked at what he could see in order to visualize what he couldn't see. He found himself

gazing at a pattern of bathroom tiles, a cardboard model of the night sky; anything which used pentagons and hexagons. What was the right shape? They fixed on twenty hexagonal (six-angled shapes) and twelve pentagonal (five-angled shapes), with an atom at each angle, which when put side by side can be rounded and closed into a ball. The geodesic dome modelled by Buckminster Fuller has this structure, as does a European football (the black bits are the pentagons and the white bits are the hexagons).

It's obvious, when you see it. Astronomer Fred Hoyle says that when Albert Einstein stated his theory of relativity, 'He put an issue of style ahead of all the confusion of detail . . . Of course, physicists never admit to style because the word brings a picture of Beau Brummell. But style it is.'

The discovery of the fullerene was a long story, beginning in the early 1980s, published in 1985, confirmed in 1990 and meriting the Nobel Prize in 1996. The Nobel citation says 'No practically useful applications have yet been produced but this is not to be expected as early as six years after the first macroscopic quantities of fullerene became available.' But the citation says 'an entirely new brand of chemistry has developed' and there are high expectations of commercial exploitation in superconductivity, astrophysics and materials.

How does one attribute the credit? This is a story full of determination and vision but also full of adventure and accident. This is true *research*, in which failure is more common than success. Kroto says the only sensible way to share the success is equally. Nobody should have more credit than anyone else. It's the only *moral* way.

Claims of intellectual property often require a more precise calculation. Although a molecule cannot be patented, the many techniques by which it is discovered can be; and the practical applications can be highly profitable. I asked Kroto whether the chances of receiving a patent encouraged or affected his work. He answered, no. He has no liking for entrepreneurs who buy up new products, putting their financial interests above the interests of society. 'Intellectual property is a can of worms.' It is practically impossible to say who should benefit commercially from research, especially the pure research that Kroto does. How does one quantify the value of ten years' worth of thinking; or the value of a bright idea at the lab bench one afternoon? How does

one calculate the work of a student who, as part of their Ph.D. research, makes a contribution as valuable as anyone's?

Kroto's interest continues to be pure science. A few years ago, he launched the non-profit Vega Science Trust to produce programmes for TV and the Internet to 'reveal the excitement of discovery and reflect science as a cultural activity'. This could be seen as riposte to those who still believe science is somehow not creative. It certainly illustrates the true nature of the creative spirit.

WHAT IS CREATIVITY?

Kroto's discovery, which was triggered by a hint of a possibility of a new molecule, led to the development of other new ideas and new products. He is interested in the former; he leaves the latter to others. There are two kinds, or stages, of creativity: Kroto's kind, which relates to our fulfilment as individuals, and is private and personal; and the kind that generates a product. The first is a universal characteristic of humanity and is found in all societies and cultures. It is found both in free societies, which encourage it, and in closed and totalitarian societies, which usually try to stifle it. When repressed for political or religious reasons, or constrained for economic ones, the result can damage individuals and weaken communities. This kind of creativity is found equally in indigenous peoples' villages, and in the West's academies and universities (like Kroto's University of Sussex), which were designed in part for this purpose. The second kind, which leads to the making of creative products, is stronger in industrial, Western societies, which put a higher value on novelty, on science and technological innovation, and on (intellectual) property rights. This kind of creativity also needs a marketplace and a smattering of legal rules. The first kind of creativity need not lead to the second, but the second requires the first.

While many people have offered descriptions of creativity, few have come close to a robust definition of its physical or chemical state. Like sleep, another basic human activity, it remains a mystery. We all sleep; we all know what it means to be 'asleep'; but there is no medical or psychological consensus about what actually constitutes sleep. The

juxtaposition is ironic. One of the problems with defining sleep is its relationship with consciousness. It is generally believed that sleep is a special case of unconsciousness. Is there a gradation from being unconscious to being asleep to being awake and to being fully conscious? And is there a similar gradation from being awake through to being creative? In other words, is creativity a special case of consciousness?

The moment of creativity is sometimes accompanied by a sense of heightened consciousness, even an explosion of consciousness. When we are being most creative, we often feel most vividly alive, and more highly focused, even to the extent of becoming less aware of everything else. Yet there is a counter view that creativity involves a loss of control of consciousness and a move to a more dreamlike state.

The psychologist C. J. Jung differentiated between these states by describing one as 'moment of high emotional tension' and the other as 'a state of contemplation in which ideas pass before the mind like dream-images'. He described creativity as a release of 'energy-tension'. He was also well aware of the need for hard work, emphasizing the role of reason in the creative process. He was scathing about his contemporaries' inclination to link creativity and neurosis: 'Disease has never yet fostered creative work; on the contrary, it is the most formidable obstacle to creation.'

Neurologist Antonio Damasio, Van Allen Professor of Neurology at the University of Iowa, has followed Jung and other psychologists, including William James, in exploring this connection between creativity and consciousness. His analysis of his patients' feelings, emotions and consciousness leads him to suggest a circle of 'existence, consciousness and creativity'. He suggests that self-awareness is an important ingredient in the creative process, as is an ability to let the conscious mind generate its own patterns without becoming subservient to previous perceptions and knowledge.

There are echoes, here, of neurobiologist Charles Sherrington's description of the brain as an 'enchanted loom' which continuously weaves a construction, an image, of the external world. The aim is to match the image and reality; or at least to explore the differences. Psychologist Mihaly Csikszentmihalyi says the 'creative excitement of the artist at her easel or the scientist in the lab comes as close to the

ideal of fulfilment that we all hope to, and so rarely do, achieve'. In his book *Creativity: Flow and the Psychology of Discovery and Invention*, he describes states of 'optimal experience' as where 'skill matches challenge'.

Recent experimental research has shown that the two different states of consciousness, which each fosters creativity in its own way, correspond to different brain states. Heightened consciousness and increased focus is associated with brainwaves in the beta range and the more dreamlike state with those in the alpha range.

Some scientists also regard creativity as a spiritual experience. Cognitive scientist Guy Claxton, author of *Hare Brain, Tortoise Mind: How Intelligence Increases When You Think Less*, says 'the core of creativity involves the popping into consciousness of a fruitful idea from "out of the blue" '. He asks, 'Why do we need to practise ceding conscious ego control in order to let this bubbling up happen more effectively? And is this state of receptive non-egoic cognition at all similar to the spiritual experience of "being still and knowing that I am God"?'

I suggest all kinds of creativity have three essential conditions: personality; originality; and meaning. The first condition is the presence of an individual person (the *personal*). People, not things, are creative. Creativity requires a person to see something, literally or metaphorically, and bring something into being. Sam Mendes, director of the five-times Oscar-winning film, *American Beauty*, refers to that moment in directing a play or a film 'when you discover something that only you can do, only you can say'. In artistic terms, if creativity is denuded of this personal spirit, it becomes kitsch.

It has long been a matter of debate whether a machine can have consciousness and whether it can create. For my purposes, machines cannot create; not even the fastest, most 'intelligent' computer can create. Machines can produce but they cannot create. 'Computers are useless,' said Picasso, 'they only give answers.' When they do produce something, they operate as we do when we discover something. The 'something' already exists and did not need us, the discoverer, to bring it into being. Computers have only the information that we allow them to have, directly or indirectly, which they manipulate only according to rules that we have given them. Dr Charles Jonscher, author of *Wired Life*, says 'manipulation which is logical has the merits of precision and clarity but, by the very nature of deductive reasoning, cannot have a trace of originality . . . This is a very old theme: the logical versus the creative.'

The personality prerequisite does not mean the creative person always has to act on their own, or be self-sufficient. Some kinds of creativity tend to be done in private, even solitary circumstances, while others require and flourish in a group. Both situations can be equally creative. Whether one person thinks and works alone, and another in a group, has no more impact on their claim to be creative than the colour of their hair. The tendencies towards solitary working and group working spring from a mix of each person's inclination, the relevant processes and products, and the social arrangements. To discover C_{60}, Kroto sometimes needed to sit in a corner, sometimes to wander down the corridor to ask a question, and sometimes to collaborate with associates who knew how to build complicated machines. To make *American Beauty*, Mendes required many people, not least because he was a novice in film-making. Trevor Nunn, director of London's Royal National Theatre, enjoys what he calls 'collective analysis', saying that 'thirty opinions are always more valuable than one, so long as everyone knows they will be adjudicated'.

The point remains. When two or more creative people are working in a team, and could not succeed without the team, even to the extent of 'losing' their identity in the team, it is still their personal talent and individual contribution that generates the creativity and the product. It holds both ways. If someone who is part of a team is *only* part of a team, then they are giving nothing of themselves and they cannot be creative. This personal spirit of collaborative creativity is well summed up in the Talmudic saying, 'If I am not for myself, who will be for me? If I am for myself only, what am I? If not now, when?'

Second, creativity is *original*. It can mean either something completely new, which I describe as 'something from nothing', or the reworking of something that already exists, in the sense of 'giving character to something'. The modern belief that man could create something 'original' was a hallmark of the Renaissance and humanism. Writer Logan Pearsall Smith showed in *Words and Idioms* that Christianity used the Latin words *creator* and *creare* (to create) to refer

exclusively to God and his actions. Only God could create, and whatever he created was original. Man could only rearrange what God had created. A poem that talked about God was original not because of its novel expression but because of its given subject matter. And a poem that talked about a building, however novel its expression, was not original for the same reason. The humanists took a different view. In the 1630s John Donne saw man as a creator when he said 'poetry is a counterfeit creation and makes things that are not, as though they were'. He meant to praise it, but in the climate of the Church of England's thinking at that time he was taking a risk. The word 'original' in the humanistic sense did not appear in Europe until the very end of the seventeenth century. The French word '*originalité*' first appeared in 1699. Horace Walpole and Thomas Gray were the first to use the English word 'original' in this sense, in 1742.

In his *Dictionary* of 1755, Dr Samuel Johnson gave several meanings of 'to create'. The first was 'to form out of nothing'. This happens, but it is rare. More often, a creative person takes and remixes existing ideas in a new and interesting way. Many dictionaries from the 1800s onwards prefer this latter definition. The new 'character' can be limited to an adjustment, a tweak, of the old or it can be something much more radical. The former displays its link with what went before, but the latter seems (and is) completely new.

Psychologist Margaret Boden, of the University of Sussex, distinguishes between ideas that are novel 'only to the mind of the individual concerned' (which she calls P-creativity for psychological creativity) and those that, 'as far as is known, are novel to the whole of human history' (which she calls H-creativity for historical creativity). Someone is being P-creative if they produce an idea that is new to them. A child can be endlessly creative in doing and making things that to adults are familiar and obvious. Children who behave like this are discovering and asserting their personality. Boden emphasizes that the 'H' stands for 'historical', not 'historic'. The criterion is not the idea's historic importance but its absolute novelty in time and space.

I see this as the difference between 'newness' and 'uniqueness'. Newness is novelty; the quality of being first. It is not an absolute measure. It can mean first in the mind of the creator, first in a group, or first in a particular period. Uniqueness is absolute. It means that the

thing created is unlike anything else which existed previously. Of course, all things that are unique were once new; but all new things are not necessarily unique. The difference is reflected in intellectual property law. Copyright law, as I show in the next chapter, requires a work to be new but does not require it to be unique. Patent law requires it to be both new and unique. For example, if two people draw the same design at the same time, both their drawings are protected by copyright. But a person who wants to patent a new product must show that nobody has ever invented a similar one.

It is footling, for our present purposes, to burrow too deeply into the origins of creative processes. The world is too vast and too mobile – too full of ideas – for us to be able to say definitely in all cases if one thing is truly original and another thing is not. We use our stored memories, often unconsciously, even when we are asleep. But the principles still stand and affect the question of ownership.

These two criteria (personal and original) are necessary elements of creativity. But they are not sufficient. We jib at calling something creative unless it expresses our creativity in a meaningful way, even if the meaning is personal or trivial. Naming an idea or invention gives it a bit of meaning, if only to create a relationship between namer and named. But we may still feel something is lacking. So the third condition is *meaning*.

There are strong psychological arguments in favour of this. When we have been creative we commonly feel that we have accomplished something; we have made or produced something with identity and character. This emotion does not depend upon other people giving their approval or even their understanding. It would be absurd to say that someone's creativity depends on another person's understanding; that van Gogh was not being creative when he painted his canvases in the 1880s because nobody understood him, and that he only became creative retrospectively when people began to buy his paintings. On the contrary. He was astonishingly creative in terms of the creative process and the number and scope of his created products.

There is support in law. Copyright laws distinguish between an 'idea', which cannot be copyrighted, and its 'expression', which can. They require an author to use skill and effort to take an idea and create an expression or a work. Patent law goes further, and requires the

inventor to carry out an 'inventive step'. Without such a step, no patent is awarded.

As we move from the personal to the industrial, and into the realms of economic transactions, so the role of meaning shifts. Teresa Amabile, Assistant Dean of Research at Harvard Business School, says that, in business, originality isn't enough: 'To be creative, an idea must be useful and actionable.' To be useful, the meaning must be communicated to the customer.

SIX CHARACTERS IN SEARCH OF AN AUDIENCE

Creativity has several other characteristics which are not necessary or always present but which round out the picture. First it is a *basic element* of life. People may disagree about many fundamental matters – morals, social behaviour, sex, politics – but most cultures and religions acknowledge creativity's primal importance as a generative power. They feel that it enlivens and makes distinctive what would otherwise be routine and repetitive. Socrates said the unexamined life is not worth living. When Shakespeare's Lear wants to express complete futility, he says 'nothing will come of nothing'. We admire creative people because they do make 'something from nothing'; and we may fear them for the same reason. When people stop being creative, in an important sense they stop living. As Bob Dylan sings, 'He who's not busy being born, / Is busy dying.' The Egyptian lawyer and economist Kamil Idris, who became Director-General of the World Intellectual Property Organization in 1997, says: 'It is a simple formula: to live, we must create.' Without creativity, we could not imagine, discover or invent anything. We would not have fire, language or science.

Creativity is also self-sufficient. We do not need outside resources to be creative (although we do need them to manufacture creative products). The second law of thermodynamics says that within a closed system organization becomes disorganized and energy runs down. This process is described as entropy. Entropy is the natural state of things unless energy is brought in from outside the system. Henry Margenau, Emeritus Professor of Physics and Natural Philosophy at Yale University, says the 'creative act', insofar as it consists of the

organization of ideas into new states and patterns, 'frequently violates' the second law of thermodynamics that entropy always increases. I can start with one idea and generate three or even thirteen depending on how creative I am. Creativity exists and grows within its own domain. Being creative is analogous to negative entropy.

Second, creativity is a *universal talent*. Everyone is creative to a degree. Children are instinctively and openly creative. All children draw. It is only when people grow older that some say they cannot draw. All children dream, and talk about their dreams. Adults are more likely to say they cannot remember their dreams.

Scientists have not discovered a gene sequence for creativity (and it is unlikely that a single gene or sequence is responsible) but recent research by clinical psychologists tends to confirm this universality. Psychologists Allan Snyder and John Mitchell at the Centre for the Mind at the Australian National University, Canberra, who have researched infant prodigies and idiot savants, suggest that everyone has inherent creative skills, even including 'prodigy' and 'savant' skills, but very few know how to exploit them. Their experiments with electronic scans show how our brains process sense data very quickly, before we become consciously aware of it. For example, when we hear a piece of music the brain immediately searches the memory for patterns of similar music in order to categorize and compare it. In this way, the brain's cognitive processes swamp our instincts. Prodigies and savants 'fool' their brains and make no such search. Prodigies are abnormal not because they have a facility that is very rare but because they do not have a block, a filter, on a talent that is universal. The researchers conclude that the physiological make-up of creativity is common; what is rare is our ability, or natural physiological disposition, to use it.

This intrinsic universality applies to creativity but not to the making of creative products. Anyone can dream and have an idea. Fewer people can produce a creative product. That depends on technical skills, physical resources, and possibly on environmental factors. Professor Michael Howe of Exeter University suggests that creative achievements depend largely upon common behavioural and environmental factors. He agrees that everyone has a basic aptitude for creativity, but suggests few people have the necessary attributes to develop it

fully. They need a long-term commitment, a firm sense of purpose, a strong motivation to succeed, a capacity to focus efforts towards specific goals, and often a supportive home environment.

Third, creativity is *fun*. It is 'play' in the sense that the Dutch historian Johan Huizinga uses the word in his book, *Homo Ludens*. Play is light-hearted and enjoyable; when it stops being fun, people stop playing. It is voluntary yet operates within given rules which everyone obeys absolutely, even though the penalties and sanctions may themselves be 'fun'. It is trivial although the outcomes may be highly significant (other people observing creative people at work are often puzzled – 'they don't look as if they're working'). In spite of being light-hearted and inconsequential, it is completely absorbing. It is uncertain and chancy; the opposite of routine and repetition. It engenders a strong sense of team spirit and thoroughly enjoys its own insider jargon and loyalties.

Samuel Johnson said that 'It very seldom happens to a man that his business is his pleasure.' But many creative people make their business out of their pleasure. They would agree with Noël Coward that 'Work is much more fun than fun.' For many, their work is their life and they do it naturally and as if inevitably. Ideally, they have a high quality of work and a high quality of life and these two qualities intertwine and support each other.

Richard Feynman, Nobel laureate, and probably the greatest physicist of the late twentieth century, decided early on while at Cornell University that

> I was only going to do things for the fun of it. Only that afternoon, as I was taking lunch, some kid threw up a plate in the cafeteria. There was a blue medallion on the plate: the Cornell sign. As the plate came down, it wobbled. It seemed to me that the blue thing went round faster than the wobble and I wondered what the relationship was between the two. I was just playing; it had no importance at all. So I played around with the equation of motion of rotating things and I found out that if the wobble is small the blue thing goes round twice as fast as the wobble. I tried to figure out why that was, just for the fun of it, and this led me to the similar problems in the spin of an electron and that led me back into quantum electro-dynamics which is the problem I had been working on. I continued to play with it in this relaxed fashion and

> it was like letting a cork out of a bottle. Everything just poured out and in very short order I worked out the things for which I won the Nobel Prize.

From this story, with its echoes of Archimedes, we learn three things. One, have fun. Two, always have a problem at the back of your mind. Three, don't skip lunch.

The fourth characteristic is a sense of *competition*. Creative people can be vigorously competitive: some for themselves, some for their work, and some for both. Some creative people set themselves very high standards. Often, these are personal, and known only to themselves. The psychologist Erving Goffman spent a lifetime thinking about 'those existential moments of truth when character is gambled'. His book *Where the Action Is* describes situations in which 'people take risks sometimes wildly unjustified both to prove themselves right and, more profoundly, to prove themselves'.

If they want to make a creative product, creative people must also compete commercially in the marketplace. Here, the sole purpose is to produce something which is new and which works. James Dyson, inventor of the Dyson floor cleaner, says he had to build 5,127 prototypes before he could start to sell his first model to the public.

Fifth, creative people, as they engage their creative talents, tend to exhibit several recognizable *personality traits*. Anthony Storr, one of the most articulate analysts of the creative spirit, believes that creative people are characterized by a greater division of opposites than are other people and, equally important, that they are more aware of those opposites. Creative people do not close off possibilities. Physicist Nils Bohr said that one of his father's favourite maxims was that 'Profound truths are recognized by the fact that the opposite is also a profound truth'; and writer F. Scott Fitzgerald said in *The Crack-Up* that 'The test of a first-rate intelligence is the ability to hold two opposed ideas in the mind at the same time, and still retain the ability to function.' Creative people, says Storr, are more determined, and have the skill, to explore or reconcile these opposites and tensions. They have a strong ego, tend to be more creative in their domestic arrangements and, if so minded, surround themselves with beautiful homes and gardens. Compared to the average person, they tend to be more independent; to have a greater concern with shape and form; to have a

greater preference for complexity and asymmetry; to have, in Goethe's words, a 'love of truth'; and to be more overtly bisexual.

Peter Bazalgette, Creative Director of Endemol Entertainment UK, part of Europe's largest TV production group, says creative people have six characteristics. The first is open-mindedness: 'It means allowing your mind to wander in an almost dream-like way.' The second quality is independence of mind: 'Creative people are rule-breakers, not rule-makers.' Third is not being afraid of change. Fourth is 'the blank sheet of paper test . . . Creative people are challenged by a space and want to put something in it.' Fifth is a well-developed sense of humour. Last, he says that creative people are competitive and ambitious.

Also, in spite of these generalizations, creativity is *surprising*. It is not preordained; it follows few rules; it evades most categories. This might seem obvious, but it needs to be said at a time when creativity is becoming a management nostrum. Creative people may exhibit typical characteristics, as Storr suggests, but one of these is idiosyncrasy. They are hard to sum up. T. S. Eliot is a case in point. He wrote harsh, elegiac poetry; worked competently in Lloyds Bank; wore rouge; enjoyed bird-watching; and loved boxing. Eliot was aware of the incongruities, according to his biographer Peter Ackroyd, but had no special interest in making them consistent with his literary work. Creative people may instinctively understand scientist and Nobel prize-winner Ilya Prigogine when he says that complexity and chaos are the natural order of matter; that, given enough complexity and chaos, a new life and a new order will emerge; but only to tip into more complexity and chaos. Salvador Dali advised: 'You have to systematically create confusion, it sets creativity free.' Creativity isn't *easy*.

Many creative artists, even the most proficient and self-aware, do not fully understand their own talent. One evening Laurence Olivier gave a majestic performance in *Henry V* which reduced his fellow performers to wide-eyed admiration. After the final curtain, Charles Laughton and others went to Olivier's dressing room to congratulate the great man only to discover him weeping. 'But, Larry,' said Laughton, 'you were marvellous.' 'I know,' Olivier said, 'but I don't know why.'

Finally, it must be said that, while creativity is generally a positive virtue, there is no guarantee. The conditions of being personal, original

and meaningful have no intrinsic moral quality. They can be good or bad. Creativity can be used for mischievous purposes. The good is no more creative than the evil. Our conception of Satan is of a grand creator, even if he created in Hell, and humans have not stopped using their talents in ways he would admire. Many contemporary dictators such as Hitler and Stalin, and cult leaders and criminals like Jim Jones and Crippen were and are creative, and their numbers or their creativity do not lessen. Creativity flourishes in the torture room, in crime and in petty meanness. Fortunately, if we include 'meaning' as a condition we have the language to make moral judgements about creativity.

RIDERS ON THE STAGE

The catchphrase of creativity is 'Eureka!', a sudden upsurge of emotion and joy. 'Eureka' is the Greek word for 'I have it' or 'I have found it' which modern Greeks still exclaim when they discover something, whether a new theory or a lost key. The use of the word is originally attributed to Archimedes, who had been asked by King Hieron to test whether a crown was made of solid gold or included silver alloys. He had puzzled about the problem for several months until, one day, stepping into a bath and seeing the water run over, he perceived a relationship between an object put into water and the mass, or weight, of the overflow. A solid gold crown would displace more mass than a composite one. According to legend, Archimedes was so excited that he leapt naked from his bath and ran into the street.

How can we generate our eureka moments? There's a nice story of a young film-maker walking along a beach near Los Angeles one evening and seeing Steven Spielberg sitting on the sand looking at the sunset. He paused, watching and waiting. When the great man got up and left, the new arrival went and sat in exactly the same place and looked in exactly the same direction. 'I know it was silly,' he confessed afterwards, 'but I just wondered if I could imagine myself into Steve's head and pick something up.' The *Paris Review* had a long-running series in which it asked famous writers how they wrote – with a pen or a pencil, on paper with or without lines, early in the morning or late at night, at a desk or at a table – in an attempt to reveal a secret trick,