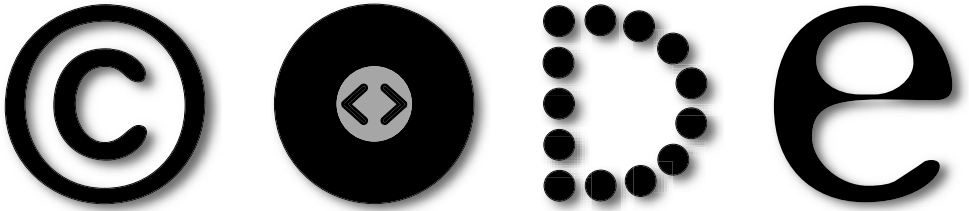


**COLLABORATION AND
OWNERSHIP IN THE
DIGITAL ECONOMY**

QUEENS' COLLEGE, CAMBRIDGE, 4-6 APRIL 2001



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THE PARTNERS

ARTS COUNCIL OF ENGLAND

The Collaborative Arts Unit of the Arts Council of England fosters the development of interdisciplinary partnerships to explore issues emerging from the intersection of art, industry, science and technology. It works at policy and practice levels, influencing contemporary debates by profiling issues and concerns emerging among experimental practitioners and groups. The network-based media culture in the UK and Europe in the 1990s proved a fertile seed-bed for the emergence of ideas which cross disciplinary as well as geographical boundaries.

The idea of CODE grew from direct contact with artists working with software and other emergent technologies whose desire to share know-how and create open platforms mirrored more established forms of collaborative exchange within the technological and scientific communities. The idea grew rapidly during its planning period in response to a collective desire among experts working in legal, commercial, scientific, artistic and other disciplinary fields to consider key trends against the backdrop in 2000/1 of anti-trust actions, the 'dot-com' crash and the growth of file-sharing and other collaborative technologies.

ACADEMIA EUROPAEA

The Academia Europaea's mission is, in part, to 'encourage interdisciplinary and international research in all areas of learning, particularly in relation to European issues...and...propose appropriate action to ensure that these issues are adequately studied'.

It has had a long-standing interest in addressing the impacts of the Internet and IT as they relate to European academic scholarship. Recent AE conferences and workshops have also increasingly focussed on the 'electronic environment' as it relates to broader issues of societal relevance. Therefore, CODE was considered to be extremely relevant to the AE mission and opportune in relation to major developments in communications technology, legislation and working practices that affect the AE's areas of primary concern. CODE represented a unique opportunity to assemble, in a single forum, a broad section of professional users and providers – all of whom were direct stakeholders with an interest in the issues surrounding the software tools that are fundamental to modern communication systems. It was seen as an experimental forum, high risk and challenging, but with the potential to make a unique contribution to the European debate.

UNIVERSITY OF CAMBRIDGE

INTELLECTUAL PROPERTY UNIT, CAMBRIDGE LAW FACULTY

The Intellectual Property Unit studies and criticises developments in IP policy across its ever-increasing range. The roles of patents, copyright, trade marks and other forms of IP as stimuli to invention, artistic creativity and the commercial processes by which these innovations are exploited has over the last decade increased markedly, provoking reactions of a vehemence previously unknown. One source of antagonism has been the incorporation of computer software first within the frame of literary copyright and now, increasingly, within the patent system.

The CODE conference enabled participants to understand how Intellectual Property Rights (IPRs) are capable of underpinning Open Source projects by liberal licence arrangements, and also how business models can be built around such operating systems. The conference threw out a challenge to other spheres of creativity to examine the ways in which they might in future rely upon IP rights.

COMPUTER LABORATORY

The Computer Laboratory, as a pioneer of digital computing and a continuing centre of computer science research, is constantly concerned with the central role of intellectual property issues in advanced technology research. The field of computer science has introduced new, post-industrial models of intellectual property to the world. At the same time, technologies arising from our field have resulted in severe challenges to the legal and economic structures of our society. The Laboratory welcomed this opportunity to reflect on past and present impacts, and also the promise that our own personal ideals may help shape the future of intellectual property.

CRUCIBLE

Crucible is a research network within and around the University of Cambridge. Its purpose is to encourage the interdisciplinary collaboration of technologists with researchers in the arts, humanities and social sciences. The CODE conference was a highly successful exemplar of an area in which this style of research has become essential. Technological developments have led to significant challenges to conceptions of intellectual property ownership. Many researchers have deep personal convictions about the proper applications of these developments, but only restricted access to intellectual and creative traditions that inform future policy. The conference was an interdisciplinary collaboration en masse, in which new dialogues were opened in an open intellectual environment.

WHY CODE?

The increase in collaborative ways of working, the value of the public commons in intellectual endeavour and social community, the desire to avoid the restrictions of intellectual property law, the spread of non-proprietary software such as Open Source (OS) and Free Software (FS), the success of peer-to-peer systems – these were the headline reasons for holding the CODE conference.

It was an ambitious agenda. At its core were the examples of the free software and open source movements that have developed around Linux and other non-proprietary software. A growing number of corporations (including Apple, Sun, IBM, Netscape and Hewlett Packard) have made their source code available under ‘public domain’ licensing models, in recognition of the greater talent pools and creativity that accrue from collaborative software development.

But there was another, deeper cause – the gradual shift in all fields towards the group, the collective, the network. In the end is the beginning. As Martha Woodmansee said at CODE, ‘We are not so much inventing a new way of working as re-discovering the collective.’

So we wanted to see if the principles of non-proprietary software might provide a basis for collaboration and creativity in other fields.

Three factors underlie this development. There are the widely-admitted technical benefits of collaborative decision-making, expressed in the phrase, ‘more eyes, fewer bugs’. Collaborative decision-making is quicker, more efficient and more effective. There is also the instinctive human feeling that if I buy something, and I see ways of improving it, I should be allowed to do so. It’s up to me. (Whereas the owners of proprietary software would say that taking the initiative in this way is practically a criminal act.) The dividing line between the technical, the instinctive and the moral is not always easy to draw.

From this core set of beliefs has grown a model of collaborative decision-making in which everyone is given access to a set of basic knowledge and makes their own contribution to its development.

This challenges conventional thinking about how we generate ideas. It undercuts the notion of the Romantic author whereby a single person has a single idea almost ‘out of thin air’. It subverts the relationship between ideas and copyright.

It offers an open, inclusive, accessible alternative to the assumption that the generation of knowledge must be closed, linear and patented. The implications go far beyond computer software.

But though the range of issues looks forbidding, and their complexity is awesome, the starting

point for CODE was very simple. It was the ownership of ideas – which is another way of saying the ownership of the future.

The idea for a conference was proposed by Bronac Ferran, Head of Collaborative Arts at the Arts Council of England, who asked Michael Century then at McGill University, Montreal, to identify key issues. His essay can be found at www.cl.cam.ac.uk/CODE.

The steering group consisted of Bronac Ferran (ACE), Alan Blackwell (Computer Laboratory, University of Cambridge, and Crucible), Michael Century, Peter Colyer (Academia Europaea), Bill Cornish (Intellectual Property Unit, University of Cambridge) and John Howkins.

The partners were the Arts Council of England, Academia Europaea, the University of Cambridge Computer Laboratory, the University of Cambridge Intellectual Property Unit and Crucible.

The sponsors were the Arts Council of England, the Daniel Langlois Foundation, the Engineering and Physical Sciences Research Council (EPSRC), the Red Hat Center, the Rockefeller Foundation, and East England Arts. We would like to take this opportunity to thank our sponsors once again for their interest and support.

The conference was held at Queens' College, Cambridge, on 4-6 April 2001 and attended by 250 people from the computer industry, research, the arts, media, design, law, business, and policy-making in Europe, North America and elsewhere.

This report gives summaries of the presentations made at the conference.

JOHN HOWKINS

INTRODUCTION TO THE CONFERENCE

John Howkins, conference chairman, is a communications consultant, Chairman of Tornado Productions and Director of Equator Group. He is the author of *The Creative Economy*.

A whole host of issues, previously treated separately, are rubbing up against each other, with implications for how we have ideas and how we share them.

We could start with psychology – the relationship between mind and brain, and between consciousness, creativity and memory. Or with sociology: the role of the individual and of the group. Or with the concept of the author: as a single person or a collective. Or with law: systems of private property rights based on different national cultural traditions. Or management: how to manage and reward collaborative work. Or art: how artists make works and how people respond.

CODE is partly about creativity on its own, that wayward talent, characteristically human but also essentially spiritual, and partly about how that creativity leads to works, objects and products; and then about how these works are marketed, traded, exchanged and sold. It's about whether these sales, in economic terms, are a consumer purchase or a capital investment.

We are talking about property. In the West intellectual property is increasingly determinant of many areas of cultural, social and economic life. There is an insistent global trend towards privatization. Industry and governments like it. But we need public spaces, and public resources, too.

So CODE is about the idea of having an idea and the impact of owning it. It is about the ethics and the economics.

I think there are three groups of questions. One: What should be our starting point? Human rights like free speech? Cultural issues like open-ness. Aesthetics issues like elegance? Systems issues, like efficiency, effectiveness? Economic rights like the ownership and licensing of products? Trade rights, driven by market liberalization?

Two: Where should we draw the line between what is public and what is private?

Three: in order for collaboration to flourish, who will champion the necessary changes to intellectual property law?

MARTHA WOODMANSEE

COLLECTIVITIES IN HISTORY

Martha Woodmansee is Professor of English, Case Western Reserve University, Ohio, USA. She has written several books on authorship and intellectual property, and initiated the term, 'Recovering Collectivity'.

Here's Goethe in 1832: 'What am I? What have I accomplished? My work is the work of a collective being who bears the name of Goethe'. Goethe is giving voice to a fact of writing that we all recognise the truth of, but which is occluded by the modern concept of the author.

This is surprising. Goethe is often seen as an exemplar of the Romantic tradition, living off personal innovation. But he knew otherwise.

Today, in the US, English studies are the gate-keepers of textual criticism and competence, affecting how we read and write, make law and interpret law. And the watchword in literary studies and composition is collaboration, because collaboration is society's norm, and students will work in this way when they graduate. The collective is normal.

'The network is fundamentally collective in nature.'

Up to the Renaissance, collective wisdom was the dominant tradition. If someone surpassed the state of the art, people explained it (away) by referring to God or Providence. Then individual genius arose, interpreting personal experience.

William Wordsworth is one of the most famous Romantic poets. Yet he relied on his sister Dorothy even when writing such avowedly personal poems as 'Daffodils'. He was not, in fact, wandering 'lonely as a cloud', but strolling with his sister. The poem deliberately presents a collective experience as a supposedly personal one.

'Collaboration is diachronic and serial as well as synchronous and momentary.'

There is a gathering revolt in English studies against the cult of romantic authorship. The singularity of author after author is dissolving into duos and trios. Nowhere is this more apparent than in early English and Renaissance studies. It's now thought that almost all these plays were written by groups of writers. Collaboration was the standard mode of creation, not an occasional deviance. These great achievements result from collective forms of making.

There are multiple similarities between that cultural moment and our own electronic digital environment.

GEERT LOVINK

CYBERCULTURE AFTER DOTCOM-MANIA

Geert Lovink is a media theorist and Internet critic; a publisher and radio producer; who is currently focused on the relationship between culture and the Internet economy.

I hope that in the next few days we can go beyond the easy, simple dichotomy between 'good' Open Source and the 'bad' corporate take-over and appropriation of intellectual property rights. I would like to plead for the establishment of a critique of OS principle and practice from an insider perspective.

The principles of OS can be extended into other fields outside software development, and can function successfully in those fields, only to the extent that they take account of the realities of life.

OS needs a new economic model. It must break free of its reliance on academic institutions and large corporations where people have fixed incomes. It's odd – Finland is the land of Linux and Nokia – and one, of course, is financing the other.

OS must align itself with alternative systems, some old, some new, such as barter, micro-payments and e-cash. In turn, these systems will succeed only if they recognise the realities of ordinary life. They must be based on how people actually live and work, and their real need to earn an income.

'The Californian ideology propagated by *WIRED* magazine has a very long echo but it's time to question it. It simply doesn't work.'

The optimism of libertarians like Esther Dyson and John Perry Barlow – that we should give everything away and somehow the money will come – is not warranted. Their optimism was a core part of dotcom-mania and should have collapsed along with the dotcom collapse. It's a model of charity, that's all. This idea – give away now, earn money later – simply doesn't work.

What was most striking about the so-called new economics was not people's greed but their blatant lack of self-reflection – and their failure to take basic economic laws into account. The resemblance between the dotcom companies and the old communist regimes is remarkable. In both, no dissent was allowed. They both marginalised negative elements. They banned feedback, a fundamental element of cybernetics.

Dotcom is the weakest link. Goodbye.

MARILYN STRATHERN

IMAGINED COLLECTIVITIES AND MULTIPLE AUTHORSHIP

Marilyn Strathern is Mistress of Girton College, Cambridge, and Professor of Anthropology.

Here are two descriptions for your mind's-eye: 'The network is fundamentally collective in nature. Each individual network is best thought of as a node in an overall hereditary web. Linking the nodes are kin relationships among and between generations'. This is a description of the human genome. The writer continues: 'It is common-ness not difference which is overwhelming. This common-ness is our collective property. And we have a right to be consulted about changes to this property.' This a collectivity imagined in terms of property ownership.

Here's a description of a different kind of kinship: 'To commemorate a death, the dead person's relatives commission a sculpture, called Malangan.' The object penetrates the eyes of those who see it. The onlookers turn quickly away, but the image stays on the retina, in the memory. Once displayed, it is killed by people placing contributions (of shells/money) at its base, and burnt. There are no claims to shared collectivities. Better to talk of multiple authors. The image is now dispersed amongst a new generation who carry it off in their own mind's eyes. The thing is destroyed, the image is kept in the mind.

In the first example, the collective property confers rights. In the second, there is no property as such.

The Malangan come from Papua New Guinea, which is typical of the kind of place we might expect to find undifferentiated collectives. In fact, we find nothing of the kind.

PNG people want to keep up the flows of assets at all times. To do so, they pay through transactions. But these transactions are doing something very different from marking an exchange of commodities.

'Keeping the flow going has a generative quality of its own. Creativity is a kind of distributive virtue.'

The key difference is not between the individual and collective but between those moments when identities are dispersed and when they are condensed or brought together. Perhaps the Malangan is doing with persons what OS is doing with information.

What is out-of-sight is often growth. And what is kept hidden may be as valuable as what is brought out and displayed.

CHRISTOPHER KELTY

‘HAU’ TO DO THINGS WITH WORDS

Christopher Kelty is an anthropologist with interests in the cultural, economic and political aspects of free software.

What is the gift economy? It's not the gift itself, nor the act of giving nor the person giving that makes a gift economy work. According to the anthropologist Marcel Mauss in his book *The Gift*, it is the spirit of the thing given which binds the giver and the given in a spirit of reciprocity. He uses the Maori word, 'hau'. For the Maori, the 'hau' might be informal but it is not metaphysical, nor unreal.

In case of FS, the 'hau' is the global system of property rules, contract systems and financial institutions. At its core, it is the free software licence (also known as the GNU General Public Licence or GPL), a technically irrelevant piece of code which is nonetheless legally binding.

I want to look at two claims. First, that OS is good partly because it is 'like' science. Second, the implications for our understanding of the gift economy.

OS and FS are not 'like' science – they are an essential part of science. For many years, until about 1993, free software existed almost exclusively in academic and scientific environments.

But when scientists are confronted with the sociological insight that the socio-technical context might affect the quality of their work, and more importantly the criteria affecting its truth, their reaction is universally one of violent denial. They assume social structures are a friction, a drag, on scientific truth.

Yet sociologists have long identified collective recognition and reputation as an essential of science, often expressed through what Robert Merton identified as the four factors in the normative quality of science: universalism; communism (shared property); disinterestedness; and organised scepticism.

This leads to my second topic, the gift economy. If FS programmers are paid in reputation, how do they spend it? The FS world is more public than the science world. Everyone's name is known. Hackers know other hackers.

This kind of reputation is not a representation of reputation. It is the thing itself. If reputation is what allows the software giver to make a return on investment, what makes the FS a gift that goes on giving is the 'hau' of the GPL.

A free science that is aware and honest about its own rules – this is the experimental demand of free software.

MICHAEL CENTURY

COPYRIGHT V. COMMUNITY

Michael Century, Chair, Arts Department, Rensselaer Polytechnic Institute, New York, is a former policy adviser to the Government of Canada.

Before introducing Richard Stallman, here's an 'RFC' – a request for comment – a tool-kit of ideas – illustrated with images and sounds by Paul Klee, John Cage, Roy Orbison and others.

My first point is to reiterate Nelson Goodman's distinction between autographic works and allographic works. With autographic art, all copying is forgery. Even the most exact duplication of the work does not count as genuine. With an allographic work, the distinction between original and forgery is not significant. The difference between autographic and allographic is not the same thing as between single or multiple. For example, etching is two-step autographic. Music, architecture and drama are all allographic.

A Paul Klee painting is autographic. It's completely dense. If you change the tiniest thing, you will change it completely.

Originally, all arts were autographic. Allographic work won its emancipation not by acclamation, but by notation. Notation is a powerful form of cross-mapping between domains. Notational art forms provide a certain kind of transformation.

The social anthropologist Mary Douglas suggests that autographic works enhance competition and that allographic works enhance collaboration.

Next, the distinction between transformative and consumptive, illustrated by 'Pretty Woman' by Roy Orbison, and a parody, 'Oh Pretty Woman', by 2 Live Crew.

US Supreme Court Justice Souter, considering whether the latter was an allowable parody under US copyright law, decided that it was. He said parody can be genuinely transformative. But he stopped short of defining the moment when consumption turns into transformation.

Can we map creative work in this way – transformative/consumptive on one axis and autographic/allographic on the other?

Final question – will there be intellectual property in XML schemes?

RICHARD STALLMAN

COPYRIGHT V. COMMUNITY IN THE AGE OF DIGITAL NETWORKS

Richard Stallman, a native New Yorker, studied at Harvard and MIT. In 1984 he founded the GNU Project to develop the GNU free operating system.

Free Software is not about money, but about freedom: freedom to study the source code, freedom to change it, freedom to distribute the improved version.

Proprietorial software divides people. Free Software is inclusive.

We can generalise this principle to most intellectual creation; not all, but most.

Copyright and technology have developed hand-in-hand. In the old world, books were written by hand, and the act of writing an original book and the act of copying were often intertwined. The printing press changed this. It led to law and regulation. The US constitution allows Congress to pass copyright laws solely to encourage progress. It was an industrial regulation, a manipulation of social behaviour.

The age of the computer is like the age of copying books: everyone can make and everyone can copy. But governments and corporations want to keep the industrial regulations, and they are using the tricks of the old Soviet regimes.

'They say we're pirates; that sharing with your neighbour is the moral equivalent of attacking a ship.'

What can we do? We can re-categorise works into three groups. One, functional works to get a job done (recipes, computer programs); these should be freely modifiable. Two, works of personal expression that state someone's views (memoirs, scientific papers); modifying these is falsifying them and is wrong. Third, works that are aesthetic and entertaining in themselves. The right to modify these is complex, and I don't have a firm view.

We should distinguish between commercial and non-commercial distribution. Commercial distribution is OK, except for functional works, because it generates revenues to keep publishing going. As for non-commercial distribution, sending something privately to your friend is OK, and the experience of Napster convinced me that free non-commercial distribution to the public is extremely useful. So, no restrictions.

The other key issue is the length of copyright, which needs a re-think. A 10 year term seems enough for most books; maybe three years for software; maybe 30 years for films because they're so expensive.

Let's try common-sense.

WILLIAM CORNISH

PRIVATE INTERESTS: FREEDOM AND CONTROL

William Cornish is Director, Intellectual Property Unit, and Professor of Intellectual Property Law, Cambridge University, and author of several books on intellectual property.

'I want to start by saying I am a professor of, not for, intellectual property law.' It's an important distinction. The academic community of law teachers is one of the few continuing sources of criticism of IP law.

IP laws, which were originally of national origin, have since the mid-1990s been driven by a mish-mash of national, regional, European and international legal principles. There are even world rights in the air. This is dangerous. Globalism upsets the balance between freedom and protection. There are strong virtues in having national laws grounded in national legal systems and national courts.

First, I will talk about owners' rights, and how proprietors exercise them; and then the public's control over proprietors.

Proprietors rights are exercised not just through IP but also through government-controlled levies on equipment, the laws of contract, trade secrets, unfair competition and so on. Proprietors have also set up technical barriers to access, especially on the Internet. The UK has had a moderate level of technical barriers since 1988. The EU passed a more comprehensive Copyright Directive in 2001. The US passed its Digital Millennium Copyright Act in 1998. Both the EU and US laws resulted from the World Intellectual Property Organisation (WIPO) Treaties in 1996 – examples of the increasing globalisation of IP protection.

Set against these are the techniques for controlling proprietors' rights. Here, there is more scope for reform. Existing techniques include limits on IPR (such as exceptions for private use and research, and copyright tribunals) and limitations on contracting (bad faith, competition law, restraints on trade).

One of the chief problems is the law's generality across different kinds of material. Copyright was intended to protect aesthetic material, and when it was extended over software, it was an 'intrusion'. Copyright is a 'cuckoo in the nest'.

Patents are inherently more possessive than copyright. They are much wider. They cover all kinds of works, all industries and all possible implementations of a creative idea, including possible future uses

The latest, worrying extension is the use of patents to protect not just technical inventions but business ideas.

JAMES BOYLE

THE TENSION BETWEEN FREE SOFTWARE AND THE ARCHITECTURES OF CONTROL

James Boyle is Professor of Law at Duke Law School, North Carolina. He has also taught at Yale, Harvard and Pennsylvania Law School. He is the author of *Shamans, Software and Spleens*.

My remarks are structured like a Greek drama – in which apparently small choices lead inevitably to a tragedy.

The dominant way of thinking about IP, based on the notion of the single author, has driven the extension of copyrights, trademarks and patents. The thrust is outward, ever outward. It is like a second enclosure movement.

This is its logic. Information goods are non-rival and non-excludable. This seems wonderful. But economists alert us to the danger of under-production – where is the incentive to produce the next novel, the next drug? So we need monopolies.

Is this argument true? We don't know. There are remarkably few empirical studies on particular IP rights. Most research is shoddy stuff. But if you accept the logic, many things follow. If you allow a monopoly then you have to allow price discrimination. Monopolies work only if owners can charge differential prices for the same good. Producers need to maximise revenues from those who badly want something and will pay a lot, and to charge lower prices to people who can pay only a little. Otherwise, there will be social loss.

But it is not just a pricing matter. The law must be involved, because the monopolist must be able to know about and control users' behaviour (in order to stop people who bought cheap selling to those who would otherwise have bought high). Forget privacy; bring in restrictions on future uses. People love cheap airline tickets. But they do not like the concomitant loss of privacy. People may admire and lock into the notion of the single author but be hostile to the implications, including price discrimination.

'I don't like this world. It's a world of pay-per-view, a world of electronic surveillance and tracking, a world in which the business plan drives the construction of democracy.'

OS profoundly challenges this world. It undermines the ecology of price discrimination. It offers a new rhetoric and a new economic logic.

I can see similarities between the environmental movement, which had to start with the concept of the public commons, and the emergence of a collaborative, public domain of information and the concept of OS.

BRUCE PERENS

A WORLD OF CONSTRAINT

Bruce Perens, film student and software engineer now working in business, is the primary author of ‘Open Source Definition’, the formative document of the Open Source movement.

To begin with, all software was given away. When you bought your Data General computer you got the source code. But then software manufacturers started to claim rights over their programs. So in 1984 when Richard Stallman had a problem with his printer, he couldn’t get access to the source code, and couldn’t fix it. This affected Richard so deeply that he embarked on the GNU Project whose benefits we are now all reaping (you and me, IBM and HP). Richard did 95% of GNU. Linus Torvalds did the final 20,000 lines, about 5%.

Free Software works, fast. I wrote my first FS program, a memory de-bugger called Electric Fence, in 1987 and put it on a website. The next day, I got back full documentation. Staggering. Another person had seen the program, and written it up.

Around this time we wrote the ‘Debian Free Software Guidelines’, a historic document, the genesis of the OS movement alongside the FS movement. We just wanted to help Richard, we didn’t want to set up a separate movement. Suggesting that OS is a separate and more pragmatic version of FS is an aberration.

‘OS was entirely intended to be a marketing program for FS.’

OS means no royalties, not even micro-payments. You can sell it. You can modify it and the results can be distributed. Immediately. OS is open to any collaborator. There are no gate-keepers. It’s usable for any purpose. (We wondered about forbidding military uses, but didn’t want to play God.) It can be aggregated. You can put FS and non-FS on the same CD. And the source code is distributed. I put this last to emphasise that FS is more than just the source code.

I also want to talk about constraint devices which manufacturers put in their equipment to protect their property – without telling us. They make video discs work only in one region. They put Global Positioning System (GPS) devices in equipment to protect local service agreements and content licensing. They put radio frequency (RF) tags in devices, which monitor the user’s movements.

Remember, we think that technology offers more freedom; but the police think it helps us to commit more crimes. We must fight to protect our privacy.

JUSTIN WATTS

PATENTS – PRINCIPLES AND PRACTICE

Justin Watts is a partner in Bristows, an intellectual property firm. He has a doctorate in electrical engineering from Cambridge University.

The underlying source of IP law is the World Trade Organisation's (WTO) Trade-Related Intellectual Property Rights (TRIPS) agreement, especially on what is and isn't patentable. But Patent Offices interpret TRIPS very differently, with appalling consequences. By competing for customers, they drive down their quality thresholds.

In particular, Europe and the US take different attitudes to software. The European Patent Office prohibits patents on software 'as such' (i.e. software which merely runs on a computer) but allows patents on software which makes a 'technical' contribution; although it is probably impossible to define a technical contribution. The US is more liberal and also allows patents on business methods.

The practicalities are always important: how criteria are interpreted, how long it takes, the costs. The EPO is unbelievably slow. The US Office is quicker because it is less rigorous. The business of all Patent Offices is to grant (more) patents. With a bit of persistence, most examiners give in. As a result, the vast majority of patents are invalid.

Everywhere, the system conflicts with OS and the GPL. Under the GPL, if you come across third-party patent rights that interfere with the software, the licence says stop using the software. It's a drastic remedy, and doesn't work.

Perens: People are patenting things in software that we used to do for free on the telephone. We must defend OS.

Stallman: I'm not part of OS. I'm trying to defend the Free Software community. I find it offensive that anyone should have power to restrict the kind of software I can run or write merely to make it easier for him to get investors in his company.

Watts: The exception for private use doesn't work if you're working in company time and potentially offering non-proprietary software on a large scale.

Stallman: You're quibbling...I'm leaving now.

It is very difficult to reform the WTO (as William Cornish said). It is much easier to change national procedures.

For example, competition law could be used to protect the GPL. Is IP an (illegitimate) restraint of business?

TIM HUBBARD

ENSEMBL AND THE HUMAN GENOME PROJECT

Tim Hubbard is Head, Human Genome Analysis, Sanger Centre, Cambridge. He is Joint Head, OS Ensembl 'Genome Annotation' project.

Mapping the human genome is the 'Moon Shot' of biology, putting biology on a whole new footing. Instead of going to a doctor who hypothesises a diagnosis, we have the potential to have completely accurate data on our physical malfunctions and appropriate remedies.

We each have 100 billion cells, each of which contains a complete copy of our genome. The human genome contains three billion chemical units (letters). Sequencing the genome means mapping the position, order, of these letters. The project started in 1985 and gathered speed through the 1990s.

At the first Bermuda meeting in 1996 it was decided to put out the data every day. At this point, one of the team, Craig Venter, stepped away and formed Celera Inc. Celera said it would make data available free to academics. As a result, the US Congress wanted to shut down the public project. As it turned out, if that had happened, the whole sequencing attempt would have failed.

'The launch of Celera nearly led to the public funds being withdrawn.'

In June 2000 it was announced it was a draw. This wasn't really true. The public and private projects had taken different approaches. The public project said, since the genome is so big, we need a two-stage process; first chop the genome into workable fragments (100,000 of them) and then select each fragment and chop again. Celera said skip the first stage and chop the whole thing into very small bits. This didn't work. Celera had to borrow data from the public project.

We now have a genome, but it's too complicated for any one person, or even one organisation, to comprehend or have a monopoly of. On the other hand, if everyone has a go at interpreting it, the result will be a horrible mess with contradictions, overlaps and gaps.

'The increase in the amount of data being gathered exceeds the increases in computer speeds.'

So we set up Ensembl, an OS project. Ensembl is as open as possible but we do have rules on annotations. It's the democratisation of annotation. It's working well. Everyone can speak, but they must put their proposals on a separate server, where it can be focussed and insulated.

The users can choose what they want to listen to.

BOB YOUNG

THE FUTURE OF INNOVATION

Bob Young is Co-Founder and Chairman of Red Hat Inc, the largest provider of Open Source technology.

Red Hat builds the most popular Linux-based operating system, billing \$80m a year. It does this by downloading 783 different packages and assembling them into the operating system. It's much more than the kernel; the kernel has 16 megabytes of code, but our full operating system requires 800 megabytes.

People continually ask how to make money if you give your ideas away for free. First, the truth is, it's difficult to make money in the software business full stop. Second, it's a fallacy that it's harder to make money in the proprietary business, unless you own a Top Ten system.

'The proprietary model is an evolutionary dead-end.'

Proprietary manufacturers have an extraordinary attitude towards their customers. They say that if a customer fixes a bug, or adds a feature, however desirable, they are breaking the licence and should go to jail. 'This is dumb'.

We do the opposite. We don't treat our customers as victims of our technology, but our technology as supporting our customers.

Red Hat is trying to bring the software industry into the 17th century. Currently, it's feudal. If someone buys a toaster, and doesn't like it, they can switch to another manufacturer. But if they buy software, and don't like it, they are forced to go back to the original vendor.

The fundamental law of business is that companies prosper by looking after their customers better than their competitors do. The software industry has been built up on the opposite principle.

OS is not a novel or untried or unrealistic way of doing business. It is a variant on barter, which is an old and powerful economic model. Everyone – engineers and customers – gets the technology they want. They can control it.

What is the biggest single threat to OS? It's the arms race by governments and regulatory bodies in London, Brussels, Tokyo and Washington which want to promote their own manufacturers by turning them into publishers and give them property rights for the life of the author plus 70 years. How does this incentivise better software? It doesn't. It merely rewards all software.

ROGER MALINA

THE CIRCULATION OF IDEAS IN ARTS AND SCIENCES

Roger Malina is Director of the Laboratoire d'Astrophysique de Marseille, France, and executive editor of *Leonardo* art publications in Berkeley, California.

My day job is astronomy. My night job is director of *Leonardo* art publications.

In my day job, we just finished a nine year project to map the entire sky in the extreme ultra-violet band. Another project is mapping the early universe; another is surveying galaxies. We have gathered 20 terabytes of data in the last decade. A typical astronomy archive has 35,000 CD-ROMs-worth of data. Round the world, over 25 terabytes (40,000 CD-ROMs) is added every year.

One of the best-kept secrets in astronomy is that, for the first time ever, scientists have more data than they can cope with. Astronomy used to be described as 'meaning rich, data poor'. It is now 'data rich, meaning poor.' As a result, it requires new attitudes towards IP. NASA used to hand out monopoly property rights over its data; now, it puts data into the public domain.

'Data is not rare but cheap and plentiful.'

To analyse these huge amounts of data requires teams of people, over a period of time. Preferably working on OS principles, as we do.

And including people at home. Three examples. One, the managers of the Search for Extra-Terrestrial Intelligence (SETI) At Home project, called SETI@home, collaborate with two million home computer users to analyse data. Two, NASA, overwhelmed with the amount of 'imaging' data from Mars, has signed up over 30,000 home users to help. Three, the new International Virtual Observatory project. The new astronomy does not point a telescope at sky but points a computer at a data set.

'A National Park of Data.'

The same trend is evident in *Leonardo*, a scholarly journal on arts, science and technology. We get many hundred of texts a year, of which over 90% have been previously posted by authors on their website (which makes nonsense of our request that all submissions have not been previously published). This has had no effect on our paid sales; rather the opposite; it actually puts a higher value on our peer review processes.

Once again, the collaborative process produces a more valuable product.

ALOK NANDI

FLUXOGRAPHIES: FROM STORY-TELLING TO STORY-SHARING

Alok Nandi is a lecturer, writer and director in new media, including mixed media. He coined the term 'fluxography' to mean 'working with flows'.

'Fluxography' indicates 'working with flows' and 'writing with flows'. Hypertext and re-mediation. Architectures where people can create and consume in a collaborative way.

Roland Barthes said: texts are 'a tissue of quotations drawn from the innumerable centres of culture.'

A computer is a device for trying to narrate. I am doing what the French call 'mise en scène' – to put in place, to direct a film, to arrange a scene.

The film analogy is very close. Cinema has paved the way and provided a model, using montage and collage. Now we can use electronic technology and architectures – if you like, electronic and media architectures.

'I am a traveller, and a story-teller.'

I play with time, create processes and occasions when ideas, things, objects, rituals, emerge and disappear. Throughout the process, the tension, the paradox, is between showing and interacting – between preserving and not showing.

'I am interested in the structure and the texture.'

The question is, what are we sharing and how are we sharing? How can we play with architecture so that we collaborate fully. How can we avoid bottle-necks?

We need collaboration to take place at the levels of both creation and of consumption.

DRAZEN PANTIC

OPEN SOURCE STREAMING

Drazen Pantic, former Professor of Mathematics, Belgrade University, was founder of OpenNet, the Internet unit of Radio B92 in Belgrade. He is now based in New York.

I am going to talk about Location One, the New York digital arts gallery, where I now work. Location One shows performance and Internet work. The Internet is at the centre of the whole operation. We explore the Internet like physicists exploring quantum mechanics – especially the effect an observer has on a particle being observed – on its nature and its position.

OS is based on three elements: intelligence, peer review and functionality. These can be found in many areas of science and art. But collaboration and open-ness do not happen of their own accord.

When I lived in Belgrade, the people opposing Slobodan Milosovic would often get 100,000 people to gather together, and then not know what to do. Sometimes, even when one has tremendous resources, as we had in Belgrade, it is difficult to know what to do. We know how people develop OS software. But can we use these collaborative powers for other social goals? There is Open Source software and Open Source journalism. There should be open source everything.

I remember Slashdot, the first example of OS Internet journalism, and very successful. But when someone posted a comment on Scientology on the Slashdot website, and the Scientologists protested, Slashdot removed the posting. Slashdot said: This is not our battle. I disagree. It is their battle. No-one can avoid this battle over freedom of expression. For this reason, I welcome the movement to start new non-profit broadcasting channels.

I am also working with the Open Source Streaming Alliance which is a non-profit network totally based on OS. It connects streaming centres around the world, like a non-profit version of Akamai (Akamai is the main global streaming network). It works with live streams which is what people actually want.

[Demonstration of live video streams from New York and California.] The system also connects Europe and Australia.

Anyone who wants to join – we give you an open invitation.

ANNE NIGTEN

ARTISTS WORKING WITH OS

Anne Nigten is Managing Director of the V2 Lab in Rotterdam. She is a visual designer and lecturer in audio-visual arts.

V2 provides a real, practical, interdisciplinary environment. We try to use OS as much as possible, both in the software designed by artists and the software designed by the technicians who work with the artists. It's sometimes hard to draw the line, especially if there is a lot of audience participation.

We like OS because it is a good way of positioning art and culture in the current computer- and business-driven market, especially on-line. OS offers a lot of very interesting possibilities for collaboration, especially with people from different disciplines. We work with the GPL but I would prefer to use a licence which was more flexible. It's a matter of ideology.

Everyone needs more resources. Nobody can keep up with what is happening. We need to network our systems.

We would like artists and software developers and scientists to work together. We need to develop an economic model that is driven by creativity instead of market forces. In this, we are working with Ars Electronica, Linz, and C-Cube, the former Soros Foundation in Budapest.

We need help with management matters, especially with managing our work flows. Ideas on how to make profit from OS would be useful. Writing and updating the documentation of what we do is always a problem. Artists don't see this as a priority. We also need help in running the help desk – again, as artists, we don't see this as a priority.

In turn, we offer ourselves as 'white mice' for testing new models of licensing our work and generating income.

ANTOINE MOREAU

THE FREE ART LICENCE (COPYLEFT)

Antoine Moreau is an artist and a founder of Copyleft Attitude which adapted the idea of Copyleft and promotes it as a means of licensing and protecting contemporary art and other cultural products.

To begin with, copyleft was restricted to software. Then in 2000 a group of programmers, artists and lawyers met in Paris to see if the morals and practice of copyleft could be applied to artistic work. The programmers and artists realised that they had much in common. They set up workshops on 'open art works'.

The free art licence is a licence designed for use by artists that permits the free copying and distribution of works. It prevents any proprietary control of the work. It can be applied to any kind of art work, digital or analog. It is simply a tool. As André Malraux said: 'Art is fed by art'.

Artists have no monopoly on art (as politicians have no monopoly on politics). We are all creators of the society in which we live – and the life we live. Politics and art are made by everyone.

Art is egalitarian. It is about sharing. But the French concept of moral rights is becoming subsumed within the more commercial Anglo-Saxon concept of economic rights – to the disadvantage of artists and of society too. Art is becoming too much like merchandise.

'The time has come to redefine authors' right and copyright.'

To Robert Musil's 'man without qualities' we must add 'art without quality' – art that is both banal and extraordinary.

Could there be an art economy – an economic practice – which in its arts and practicalities is concerned with liberté, égalité and fraternité?

Moreau concluded with reports of copyleft cooking parties with free cooking, and copyleft garden parties with the free sowing of seeds. 'Let's have more parties.'

'Let's copyleft each other.'

JOHN NAUGHTON

THE FUTURE OF KNOWLEDGE

John Naughton is leader of the **Going Digital** project at the **Open University** and a fellow of **Wolfson College, Cambridge**. He is the author of ***A Brief History of the Future***.

John Naughton introduced the session with some manifestations of DeCSS (the decryption code for DVDs) in visual terms, in speech, as a haiku, and on a T-Shirt.

He said the makers of the T-Shirt had incurred legal charges under the US Digital Millennium Copyright Act (DMCA) and asked: Is there anyone outside the warped minds of the music and movie industries who seriously thinks these people are guilty of a crime or a tort?

Anybody who thinks that the subject matter of this conference is software or technology is missing the point. This conference is about very old-fashioned things – freedom, liberty, ideas.

The DMCA states that people should simply not be allowed to engage in some kinds of thinking. According to the DMCA, if you start thinking about decryption, it's illegal. We are getting back to the very fundamentals of the debate that was started by Thomas Jefferson. But today's Americans understand it much less than did the citizens of Jefferson's day.

We getting to a point where some things that should be public are being built on the basis of a closed code which the public is not allowed to get involved in.

There is a clear connection between open and closed source, and an open and closed society.

Those of us who work in universities have become very dismayed by their dangerous tendency to get involved in IP. Here in Cambridge there has been a management proposal that work by undergraduate and graduate students should become the property of the university.

Though there is a good bit of news from, surprisingly, the US. MIT has announced that it will give away on the Web all its teaching materials, for ever, without charge.

ROBIN MANSELL

SOCIAL CONSTITUENCIES AND KNOWLEDGE PRODUCTION

Robin Mansell is Professor of New Media and the Internet at the London School of Economics and specialises in global policies on new technologies.

Speculating on the future of knowledge, we must grapple with the way in which different social groups and communities do what they do.

‘Are we all programmers now – or must we become so, in order to survive?’

Or are we divided by a large, opaque wall, behind which are programmers and in front of which everyone else carries on without really knowing or participating in what is happening behind the wall?

There are two models for the production of knowledge, and the handling of profit. The dominant current model is based on ownership and commodity transactions, and knowledge production is a matter of claiming rights and extracting rents.

Another model – the cultural exchange model – is about both extracting rents from other services and goods, and also completely sharing between people, perhaps by barter arrangements. These two models are in tension.

The choice is complicated by the role of social constituencies. There are sellers (e.g. Microsoft) and buyers (e.g. everyone) continually engaging in conventional commercial transactions. Then there is a middle group which earns revenues indirectly (e.g. OS). We can envisage a future in which governments and social contracts sustain these groupings at their current power and size. Or we can speculate that the indirect-revenue group will grow, perhaps by also engaging in direct transactions (which is the most likely scenario).

‘We’re not really talking about technology, markets or IP, but our ethical right to be able to talk about a way of creating and producing which is different from the conventional model’.

Governments must seek to maintain and even expand the public domain not just in the narrow sense of rights – or lack of rights – but as a place where individuals and groups can develop ideas and new means of generating knowledge.

So the key issue is the building of skills and capabilities for everyone, not just sophisticated programmers, to produce and develop the kinds of knowledge they decide they want.

RISHAB AIYER GHOSH

MEASURING CONTRIBUTION AND OWNERSHIP

Rishab Aiyer Ghosh is **Managing Editor of *First Monday***, a peer-reviewed Internet Journal, and **Programme Leader at the International Institute of Infonomics**.

Non-monetary economics has become visible and even mainstream. It is not so unusual a term as it was.

Barter is non-monetary but is not transaction-less. I give you a fish, you give me two potatoes. We know what's going on: who is involved, what is being exchanged and the relative values.

If we put our goods into a cooking-pot and produce a fish-and-potato stew, we would produce something of greater value than the two ingredients, even if we disagreed about our relative contributions. This is still the result of barter.

But if we were dealing in information, we would all have it all. We don't have to share. I get everything in the pot, and you get everything in the pot. In fact, I may get more. In Bob Young's example, I write 100 K/bits but I get access to 800 M/bits.

Throughout, when dealing in information, we don't have many identifiable transactions. If you can't identify transactions, you can't quantify them and you can't develop economic tools or an economic model.

But it doesn't really matter. You can still develop what I call balanced value flows. If I value your two potatoes more than my one fish, and you do the opposite, we're both happy. It doesn't matter where my fish came from, or where it goes. Nor does it matter where the transaction takes place. It could be in a cooking pot or a black box or the Internet. If the two value flows are balanced, we are both satisfied.

The absence of money may be a problem. Of course, money is useful. It's quantifiable, a functional measurement tool, fungible and a handy metaphor. It has a false objectivity.

Without money as tool of measurement, we must find a proxy. The principles of Free Software may provide it. The protagonists and transactions can be identified. We can develop a model.

PHILIPPE AIGRAIN

FROM FREE/OPEN SOFTWARE TO OPEN INFORMATION

Philippe Aigrain is in charge of Free/Open Source Software activities in the European Commission's Information Society Technologies Research (ISTR) Programme.

We must broaden our sense of knowledge, widen the trawl.

We need tools to allow criticism, creation and annotation on a continuing basis. Especially, but not only, for production by small groups. Here, too, we need a real acceptance of the public domain, and genuine exceptions for private use.

We must act according to the right set of values. For example, we must maintain the principles of voluntary contributions.

We should accept that nobody knows the exact economic benefits of all of this. We know some of the costs, and some revenues, but not the total amount; we just don't know. So we need experiments.

Otherwise, we will face a real tragedy of the enclosures.

This will take time, to work it out, to convince people. But we cannot afford not to do it. Many people are concerned; at the EC, we receive a stream of questions and concerns.

So, what is the way forward? First, we must re-think the framework of intellectual property rights. This is crucial. They have taken on a life on their own. We must re-connect rights with capacities, with obligations (as Nobel Laureate Amartya Sen has done, here in Cambridge). We must have a IP regime in which the public domain is not an exception, or an aberration, or vulnerable. It must be central to what we do, to the way forward.

AFTER CODE

These brief summaries of the CODE conference reveal more than a trend; they reveal the beginnings of a movement, a turning point. A diverse group of computer programmers, artists, lawyers, anthropologists, musicians, astronomers, biologists, business executives and broadcasters came together to discover a common concern which they articulated from many different perspectives.

The timing was right. During 2000/1, Linux had broken through to public notice. Microsoft's dominance had been challenged by a US anti-trust case. Napster had shown how peer-to-peer sharing could work, causing panic among many in the music industry. And, by widening the scope of patents to include genetic material and business methods, Patent Offices had raised public concern about intellectual property rights.

Two comments about CODE captured the essence of what was happening. The first speaker was John Naughton who introduced the final session, 'The Future of Knowledge' (a daunting title) by saying: 'Anybody who thinks that the subject matter of this conference is software or technology is missing the point. This conference is about very old-fashioned things – freedom, liberty, ideas.' And Jane Szita, writing afterwards in *Doors of Perception* magazine, said, 'It will be the biggest missed opportunity of all time if all that Free Software liberates is code.'

The starting point of CODE had been two basic questions about Free Software and Open Source. What exactly are they? Is their approach to freedom and collaboration applicable outside computer programming? The organisers soon reversed the questions: What is the nature of collaborative work? How does FS/OS add to our understanding of it? Does FS/OS help us to defend freedom – artistic freedom and academic freedom? Does it help us to understand emergent art forms?

The CODE programme, presentations and discussions presented a comprehensive agenda for the discussion of collaboration and creativity. It provided a road-map. It helped people to navigate the way forward. It showed linkages between topics as different as musical notation, computer software, patents, anthropology and literary criticism.

The Arts Council of England, which initiated the conference, and the Academia Europaea see these linkages as an integral to their work – both institutionally and intellectually. ACE was glad to collaborate not only with the Academia Europaea but with Britain's Engineering and Physical Sciences Research Council, the Rockefeller Foundation and the Daniel Langlois Foundation. Its post-CODE series (www.diffusion.org.uk) publishes artists' texts on intellectual property, collective ownership and the arts. ACE and the Crucible agency also built on CODE by working together on an innovative Fellowships programme during 2001/2 at Cambridge University,

forging links between artists and technologists. The AE also found new partnerships. After the conference it highlighted the need for a clear, co-ordinated European effort to safeguard academic freedom (especially the freedom to publish) and to maintain unrestricted access to information and knowledge across the electronic landscape. It became a principal contractor in the EU Knowledge Society SERENATE project (www.serenate.org) which is analysing ways in which high-speed data networks can support European academia and research, and which is directly relevant to CODE. In November 2001, it delivered a policy statement to the President of the EU which addressed several CODE priorities.

Since the conference, the participants have exchanged many ideas, proposals, comments and articles. New thoughts about the nature of OS flourish. In a note to ACE, Scott deLahunta said that it may be a mistake to conflate the writing of code with the writing of prose, or indeed with writing at all. He suggested 'building' is a better term because it describes the re-assembling of existing material – and reveals its inherently collaborative nature.

James Boyle's comparison of the Free Software movement with the environment movement resonated with many people. He likened the recent interest in OS with the initial interest in environmentalism in the 1970s. He said, 'The first environmental activists were scattered and without mutual ties. The concept had to be invented before it could be defended.' We need a new concept that integrates creativity, collaboration and public ownership.

The work of sponsor Centre for the Public Domain continues to have an impact (although the Center itself no longer exists). In 2001, it supported the new Creative Commons, based at Stanford Law School, which is developing an operational set of copyright licences, free of charge, so works can be put into the public domain. Its aim is to generate flexible, generous licences that permit the copying and creative re-use of copyright works. 'It's a way to mark the spaces people are allowed to walk on', said Lawrence Lessig, who will take partial leave from Stanford Law School for three years to serve as chairman. Creative Commons hopes to create a 'conservancy' for donations of intellectual property whose owners prefer a tax break rather than selling into private hands.

Equally important, Duke University announced it had received a donation of \$1 million for a new Center for the Study of the Public Domain. James Boyle, Duke faculty director, said that 'over the last 20 years IP rights have expanded dramatically over gene sequences, business methods and much more. Little by little the public domain is shrinking. The aim of the new Center is to bring greater balance to the debate'.

The battle for the freedom of ideas will continue long into the future. As CODE claimed, this really is a debate about the future of knowledge. It's a call for alternative approaches to resolving tensions between private property rights and the public domain, and every bit as important as the battle over land reform – or lack of it – that has shaped politics and commerce of the past 500 years.

