Introduction

Monica, Carsten

9/7/2025

Quantum

AI & Data science

Sustainable technologies

Medical physics
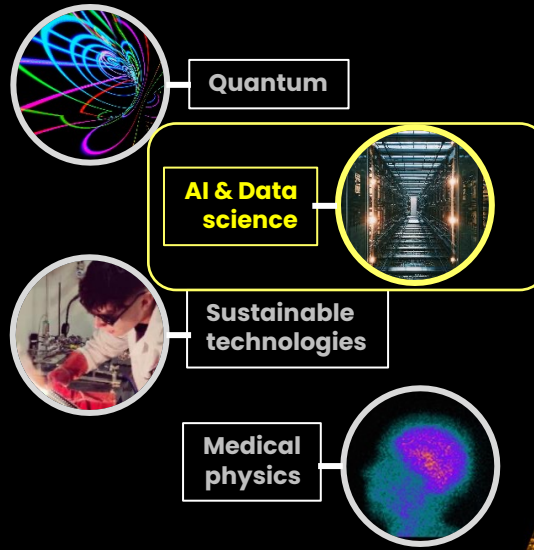
International Events since last meeting

- **EU CAIF** (16-20, June 2025): https://agenda.infn.it/event/43565/
  - Direct and indirect contributions from Liverpool:
    - Andrea Santamaria – talk presented on ML in accelerator physics
    - Monica D'Onofrio – talk presented by collaborator on recent paper
  - Discussions around working groups and activities, see closing report
  - https://eucaif.org/ - people can subscribe to working groups

- **European Strategy for Particle Physics**, Symposium Venice 23-27 June 2025
  - Preparatory group on computing highlighted several aspects of common relevance:
    - Sustainable computing and AI
    - Efficient software – contribution from Eduardo Rodriguez
    - New technologies: quantum computing and neuromorphic processors
    - Scalability and resource needs → different if want to focus on ML tools or more general AI tools (i.e. LLM). There seems to be preference of the former… conservative view?

- **International Particle Accelerator Conference** (IPAC'25) in Taiwan
  - Andrea Santamaria – talk and discussion group on ML

- Horizon Europe **ARTIFACT** initiative in accelerator science now being developed into portfolio of EU projects (IRIS, TWINRISE, IFAST2, ARTIFACT-DN, etc.) by CPW

- WG 1: Foundation models
- WG 2: Co-Design
- WG 3: FAIR and sustainable AI
- WG 4: JENA WP4 (ML and AI infrastructure and resource needs)
- WG 5: Building bridges - Community, connections and funding

National events since last meeting

- **Computing collaboration partnership initiatives** – existing in multiple fields

STFC Scientific Computing

- A department within STFC's National Laboratories
- Provides direct computational infrastructure, science and engineering support to STFC's national facilities and users
- Also working externally with researchers across UKRI and internationally
- 300+ Research Technical Professionals (RTPs) based at both STFC's Daresbury and Rutherford Appleton Laboratories

Daresbury Laboratory
Warrington, Cheshire

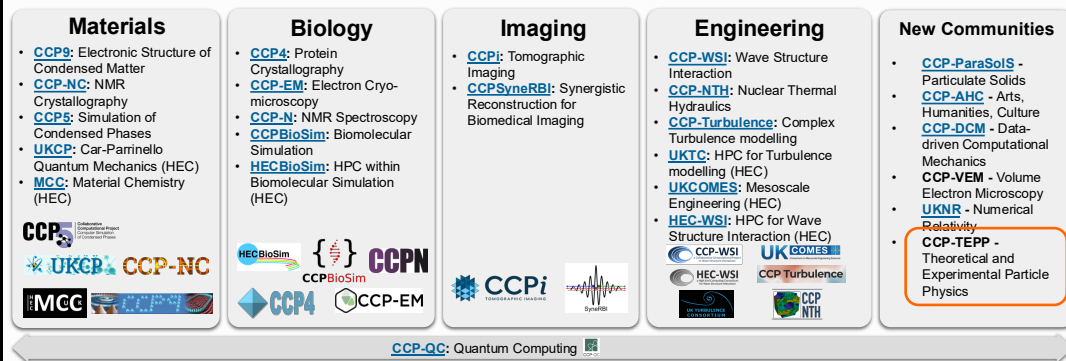Rutherford Appleton Laboratory
Chilton, Oxfordshire

A Part of the UKRI DRI

- ✓ Sharing of expertise
- ✓ Shared aims and strategy
- ✓ Community driven research software development
- ✓ Shared approaches to data
- ✓ **Greater value from**

Strategic Partners

UK Commercial (e.g. Rolls Royce, Met Office, NVIDIA)

International (e.g. Sandia National Lab, CECAM, Psi-k, MaX)

25 Research Communities

31 UK higher education institutions

5 national facilities and institutes

Collaborative Computational Communities

Applied AI

Accelerated Computing

Thousands of researchers

FAIR

Green Compute

CoSeC

Research Software Infrastructure

Skilled RTPs

Training

Quantum Computing

Development of key national skills

- CoSeC directly funds and supports 13 CCPs and 6 EPSRC funded HECs
- From 2025 CoSeC funds and supports 6 scoping projects to develop new communities

Materials
- **CCP9**: Electronic Structure of Condensed Matter
- **CCP-NC**: NMR Crystallography
- **CCP5**: Simulation of Condensed Phases
- **UKCP**: Car-Parrinello Quantum Mechanics (HEC)
- **MCC**: Material Chemistry (HEC)

Biology
- **CCP4**: Protein Crystallography
- **CCP-EM**: Electron Cryo-microscopy
- **CCP-N**: NMR Spectroscopy
- **CCPBioSim**: Biomolecular Simulation
- **HECBioSim**: HPC within Biomolecular Simulation (HEC)

Imaging
- **CCPi**: Tomographic Imaging
- **CCPSyneRBI**: Synergistic Reconstruction for Biomedical Imaging

Engineering
- **CCP-WSI**: Wave Structure Interaction
- **CCP-NTH**: Nuclear Thermal Hydraulics
- **CCP-Turbulence**: Complex Turbulence modelling
- **UKTC**: HPC for Turbulence modelling (HEC)
- **UKCOMES**: Mesoscale Engineering (HEC)
- **HEC-WSI**: HPC for Wave Structure Interaction (HEC)

New Communities
- **CCP-ParaSolS** - Particulate Solids
- **CCP-AHC** - Arts, Humanities, Culture
- **CCP-DCM** - Data-driven Computational Mechanics
- **CCP-VEM** - Volume Electron Microscopy
- **UKNR** - Numerical Relativity
- **CCP-TEPP** - Theoretical and Experimental Particle Physics

CCP-QC: Quantum Computing

Are you familiar with these funding schemes? Could they be helpful ?

Now forming CCP in PP (theory and experiment)
- Helping to identify practical technical objectives (computational research)
- Creating a team of Research Technical Professionals with complimentary research aims and capabilities

CoSeC

National and local events since last meeting

- AI for Innovation (May 2025): organized by LIV.INNO, gave context for recent AI developments, offering insights from data scientists, and sharing real-world industry experience from those who have started their journey. **See next slides**

- AI NVIDIA (May 2025): contributions from Alex Hill and participation from the department (see also John's brief)

  - NVIDIA ambassador at Liverpool
  - Training opportunities

- Data Science in Healthcare and Health Technologies workshop (LIV.INNO) – see earlier report

Institutional frontier: AI for LIFE. "Advancing human potential through AI innovation to improve health, strengthen communities, and drive inclusive economic prosperity".
→ Case studies presented – provide one or two from Physics?

AI for Innovation Summit

Speakers included:

- Andy Walker, Head of Commercial for Deep Tech at TTP
- Ben Scowen, Vice President and UK and Ireland Cloud and Core Leader, Kyndryl
- Steve Rotheram, Mayor of the Liverpool City Region
- Robert G. Cooper, Professor Emeritus at McMaster University's De Groote School of Business
- Sana Khareghani, Former Head of the UK Government's Office for AI and Professor of Practice at KCL
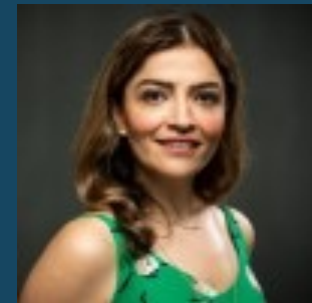
AI for Innovation Summit

Breakout groups on:

- Physical AI for product development (James Zickefoose (Mirion) and Douglas Boubert (PhysicsX)

- AI for improving processes (Adam Ruby (KPMG) and Marya Bazzi (sea.dev))

- AI for agent development (Boris Bolliet (Cambridge University) and Michalis Smyrnakis (Hartree Centre)

- AI in highly regulated and safety critical environments (Richard Cannon (NATS) and Rob Firth (Hartree Centre)

LIV.INNO
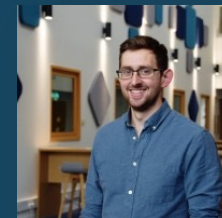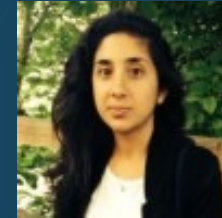
AI for Innovation Summit

Used the Zoom events platform hosted by STFC to run this event.

194 registered participants.

- Event was accessible to anyone anywhere in the world
- Website creates a lasting platform for anyone interested to reach out
- Many interesting, relevant and often new contacts established

Excellent opportunity to follow up on Kyndryl launch event the week before – potential for important strategic partnership.

LIV.INNO
www.livinno.org

AI for INNOVATION

"What impact will AI have on my business, and where is the biggest opportunity for gain?"

These are the big questions challenging those tasked with innovation strategy and new product development across all industry sectors.

This pragmatic conference aims to provide context for recent AI developments, offer insights from data scientists, and share real-world industry experience from those who have started their journey.

The interactive format will enable you to explore the potential of AI for your organisation, talk to practitioners and develop an action plan.

You have the option to select a virtual exhibitor stand to showcase your company and network with others at the conference.

Join us for free!

REGISTRATION

bit.ly/ai-for-innovation-summit

Wednesday, 7th May 2025
11am – 5pm (BST)

ONLINE CONFERENCE

LIV.INNO

Podcast and news coverage

Podcast recorded with the IoP

Carsten and Andreea Font discussing the LIV.INNO CDT and future AI training needs and opportunities.

You can listen to it [here](#)

LIV.INNO

International News Coverage

For discussion

- Infrastructure
- Career developments
- Public engagement

Follow ups from previous discussion

We discussed in the past about having a common platform to share tools and knowledge, for interdisciplinary collaboration, staff-student engagement, and open science principles. How-to?

Enabling Collaborative AI Research Infrastructure in the Physics Department

- **Internal Collaboration Platform (GitLab / Gitea / similar)**: *Est. cost: £5k –£8k*
  - On-premises or cloud-hosted instance for secure, university-wide version control and collaboration
  - Enables sharing of code, models, data, and documentation
  - Optional CI/CD pipelines for reproducible workflows
  - User management, integration with Single Sign-On (SSO) or LDAP
- **Initial Software Licenses, Support and Setup**: *£3k – £5k*
  - Includes security configuration, containers (Docker/Singularity), and user support
  - Optional ML/AI tools for education research (e.g., analytics dashboards)

Would this be a good starting point? Exploring options …

Follow up from previous discussion

- Could be also extended to infrastructure – an example:

  - **High-Performance AI Server** — *Estimated cost: £35k – £40k*
    - 2–4 GPUs (e.g., NVIDIA A100, H100, or RTX 6000 series) for machine learning and data processing
    - 256–512 GB RAM
    - 2 TB SSD + high-speed storage for datasets
    - Redundant power supply and networking capability
    - Pre-installed ML software stack (e.g., PyTorch, TensorFlow, JAX, etc.)

  This could also come with training and Onboarding Workshops (i.e. NVIDIA trainings)
    - For staff and students across different research clusters
    - Sessions on using the AI infrastructure, best practices for ML/AI, reproducibility, and open science
    - Customised material for physics education and interdisciplinary use

  - **Storage and Backup for Shared Research Data** – *£5k*
    - Dedicated storage array (e.g., 50–100 TB) for datasets and trained models
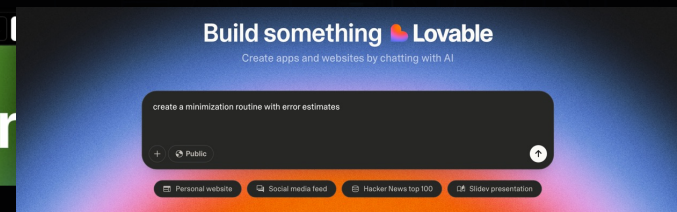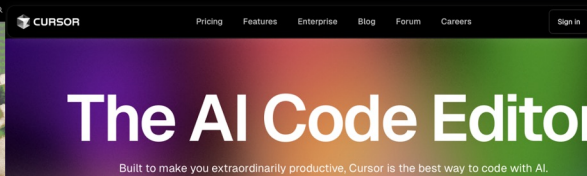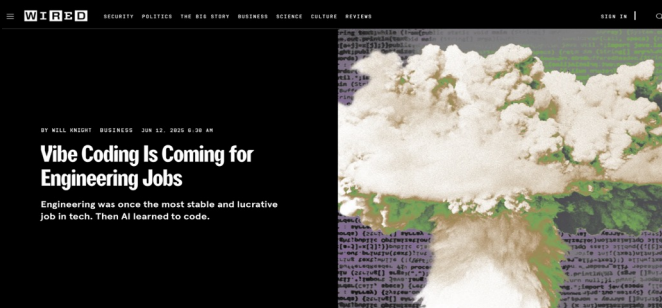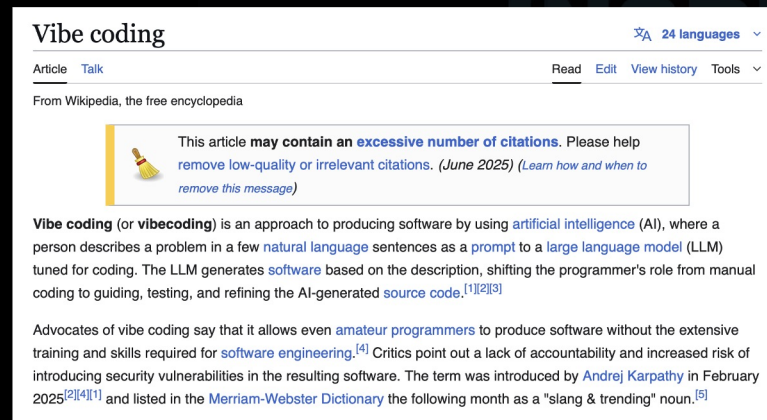   - Daily backups and versioning for reproducibility

Reflection: The use of ML and AI – impact on jobs ?

[from ES PP computing summary:]

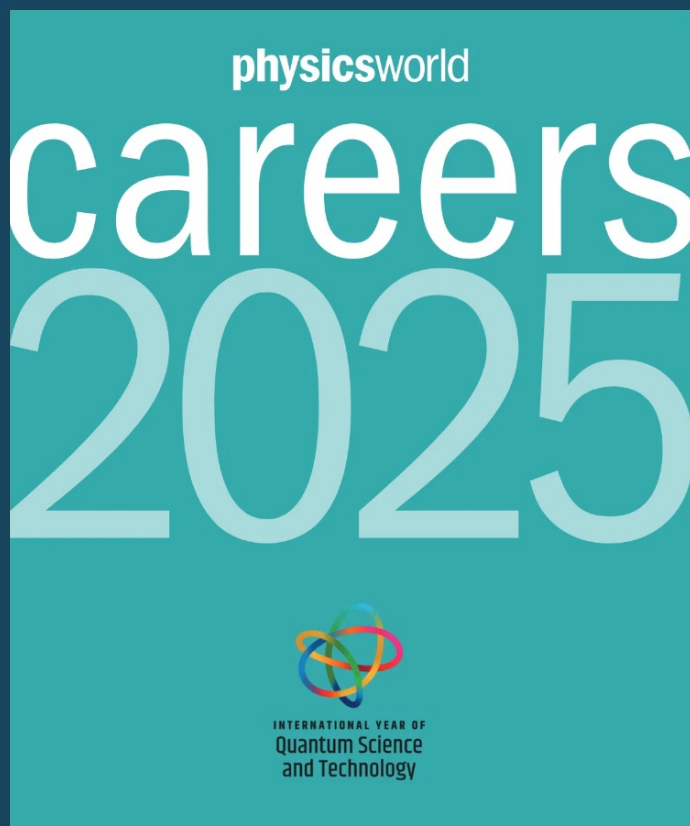**It is hard to guess how transformative AI will be in the future years:**

A good example is the impact of **vibe coding** in industry in the last 6 months:

The Washington Post
Democracy Dies in Darkness

Business   Economy   Economic Policy   Personal Finance   Work   Technology   Business of Climate

Department of Data

More than a quarter of computer-programming jobs just vanished. What happened?

Learning to code was supposedly the salvation of millions of liberal art majors. But now programming jobs are plummeting. The Post's Department of Data tries to figure out what's going on.

March 14, 2025

Vibe coding
文A 24 languages

Article   Talk   Read   Edit   View history   Tools

From Wikipedia, the free encyclopedia

This article **may contain an excessive number of citations**. Please help remove low-quality or irrelevant citations. *(June 2025)* *(Learn how and when to remove this message)*

Vibe coding (or **vibecoding**) is an approach to producing software by using artificial intelligence (AI), where a person describes a problem in a few natural language sentences as a prompt to a large language model (LLM) tuned for coding. The LLM generates software based on the description, shifting the programmer's role from manual coding to guiding, testing, and refining the AI-generated source code.[1][2][3]

Advocates of vibe coding say that it allows even amateur programmers to produce software without the extensive training and skills required for software engineering.[4] Critics point out a lack of accountability and increased risk of introducing security vulnerabilities in the resulting software. The term was introduced by Andrej Karpathy in February 2025[2][4][1] and listed in the Merriam-Webster Dictionary the following month as a "slang & trending" noun.[5]

WIRED   SECURITY   POLITICS   THE BIG STORY   BUSINESS   SCIENCE   CULTURE   REVIEWS

BY WILL KNIGHT   BUSINESS   JUN 12, 2025 6:30 AM

Vibe Coding Is Coming for Engineering Jobs

Engineering was once the most stable and lucrative job in tech. Then AI learned to code.

CURSOR   Pricing   Features   Enterprise   Blog   Forum   Careers   Sign in

The AI Code Editor

Built to make you extraordinarily productive, Cursor is the best way to code with AI.

Build something ❤ Lovable
Create apps and websites by chatting with AI

create a minimization routine with error estimates

+   🌐 Public

📄 Personal website   📱 Social media feed   📰 Hacker News top 100   📊 Slidev presentation

What are the risks and opportunities for our students?

Physics world careers brochure

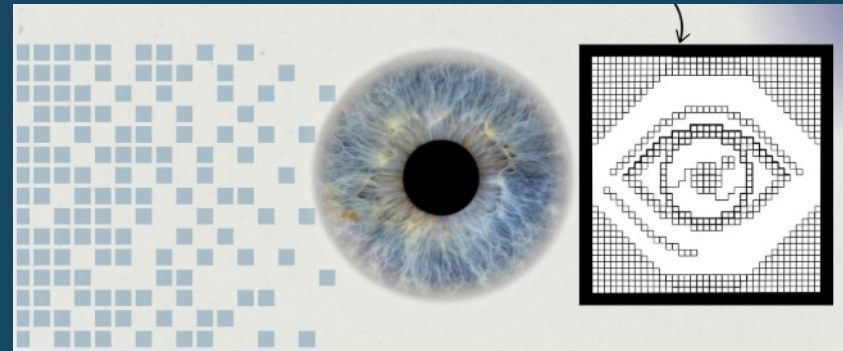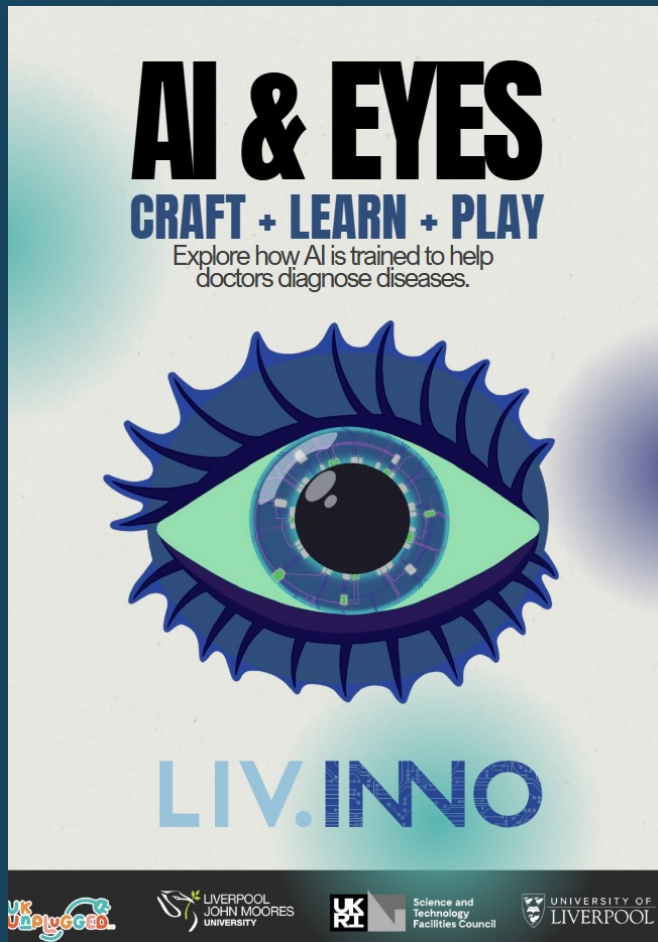physicsworld.com/p/magazine/archive/physics-world-careers-2025/
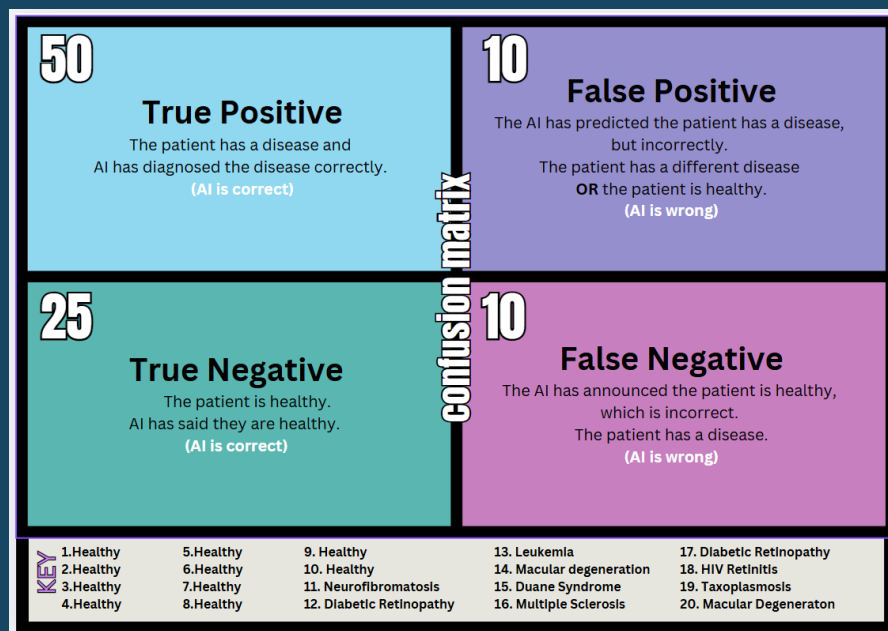

LIV.INNO

A lot can be done for public engagement and promote how AI in physics can be relevant for general public. An example:

AI & Eyes

With contributions also from one of our PhD LIV.INNO student (Rob McNaulty)

AI & Eyes

| 50 **True Positive** The patient has a disease and AI has diagnosed the disease correctly. (AI is correct) | 10 **False Positive** The AI has predicted the patient has a disease, but incorrectly. The patient has a different disease **OR** the patient is healthy. (AI is wrong) |
| 25 **True Negative** The patient is healthy. AI has said they are healthy. (AI is correct) | 10 **False Negative** The AI has announced the patient is healthy, which is incorrect. The patient has a disease. (AI is wrong) |

confusion matrix

KEY
1. Healthy
2. Healthy
3. Healthy
4. Healthy
5. Healthy
6. Healthy
7. Healthy
8. Healthy
9. Healthy
10. Healthy
11. Neurofibromatosis
12. Diabetic Retinopathy
13. Leukemia
14. Macular degeneration
15. Duane Syndrome
16. Multiple Sclerosis
17. Diabetic Retinopathy
18. HIV Retinitis
19. Taxoplasmosis
20. Macular Degeneraton

- **Best AI Doctor** - game

- **How to train your AI** – insights into our R&D

- **Eye suncatcher** – hands-on activity

- **Eating for your eyes** - Nutrition advice.

Activity box will now be used more widely, including BSF and music festivals in UK and abroad.