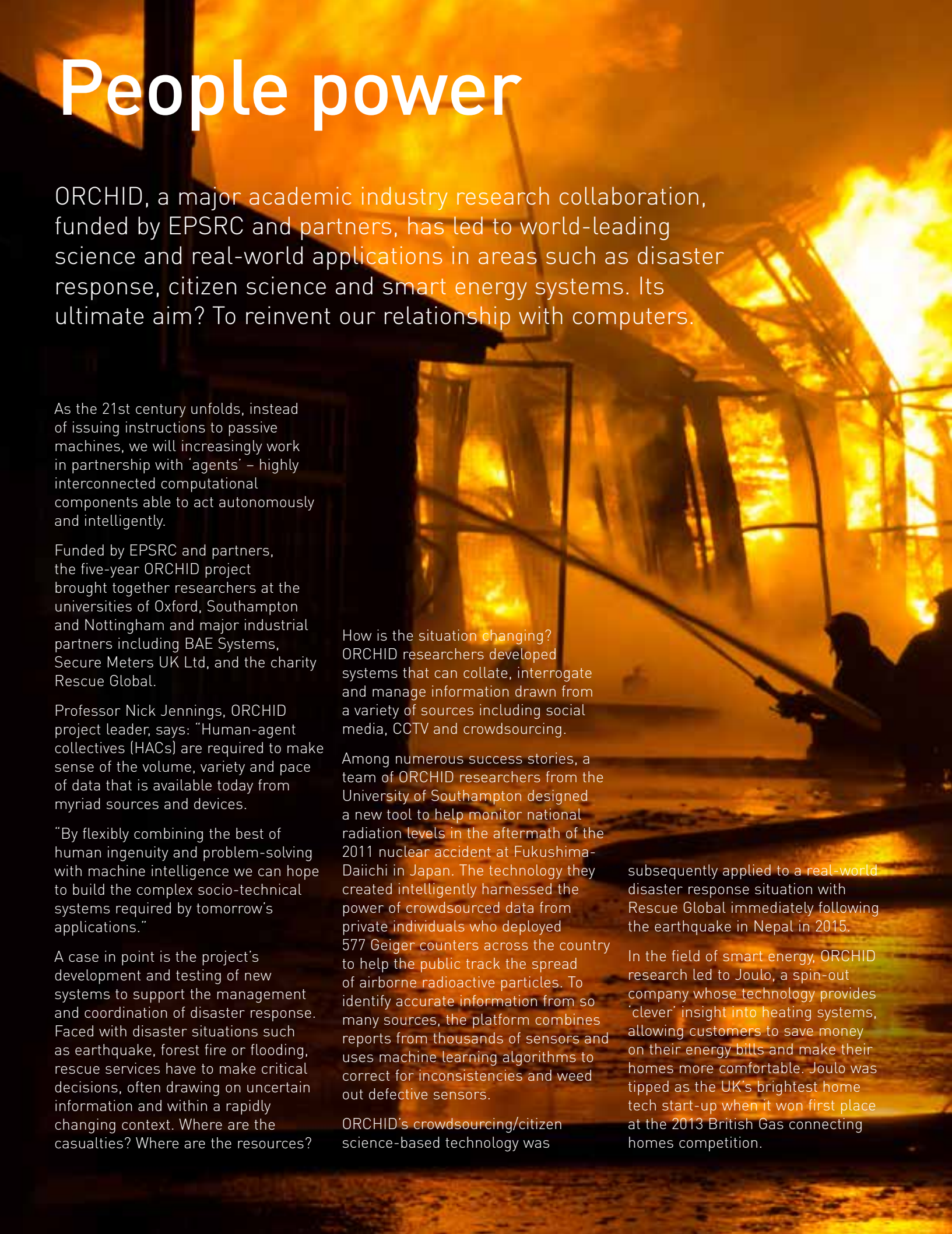
People power

ORCHID, a major academic industry research collaboration, funded by EPSRC and partners, has led to world-leading science and real-world applications in areas such as disaster response, citizen science and smart energy systems. Its ultimate aim? To reinvent our relationship with computers.



As the 21st century unfolds, instead of issuing instructions to passive machines, we will increasingly work in partnership with 'agents' – highly interconnected computational components able to act autonomously and intelligently.

Funded by EPSRC and partners, the five-year ORCHID project brought together researchers at the universities of Oxford, Southampton and Nottingham and major industrial partners including BAE Systems, Secure Meters UK Ltd, and the charity Rescue Global.

Professor Nick Jennings, ORCHID project leader, says: "Human-agent collectives (HACs) are required to make sense of the volume, variety and pace of data that is available today from myriad sources and devices.

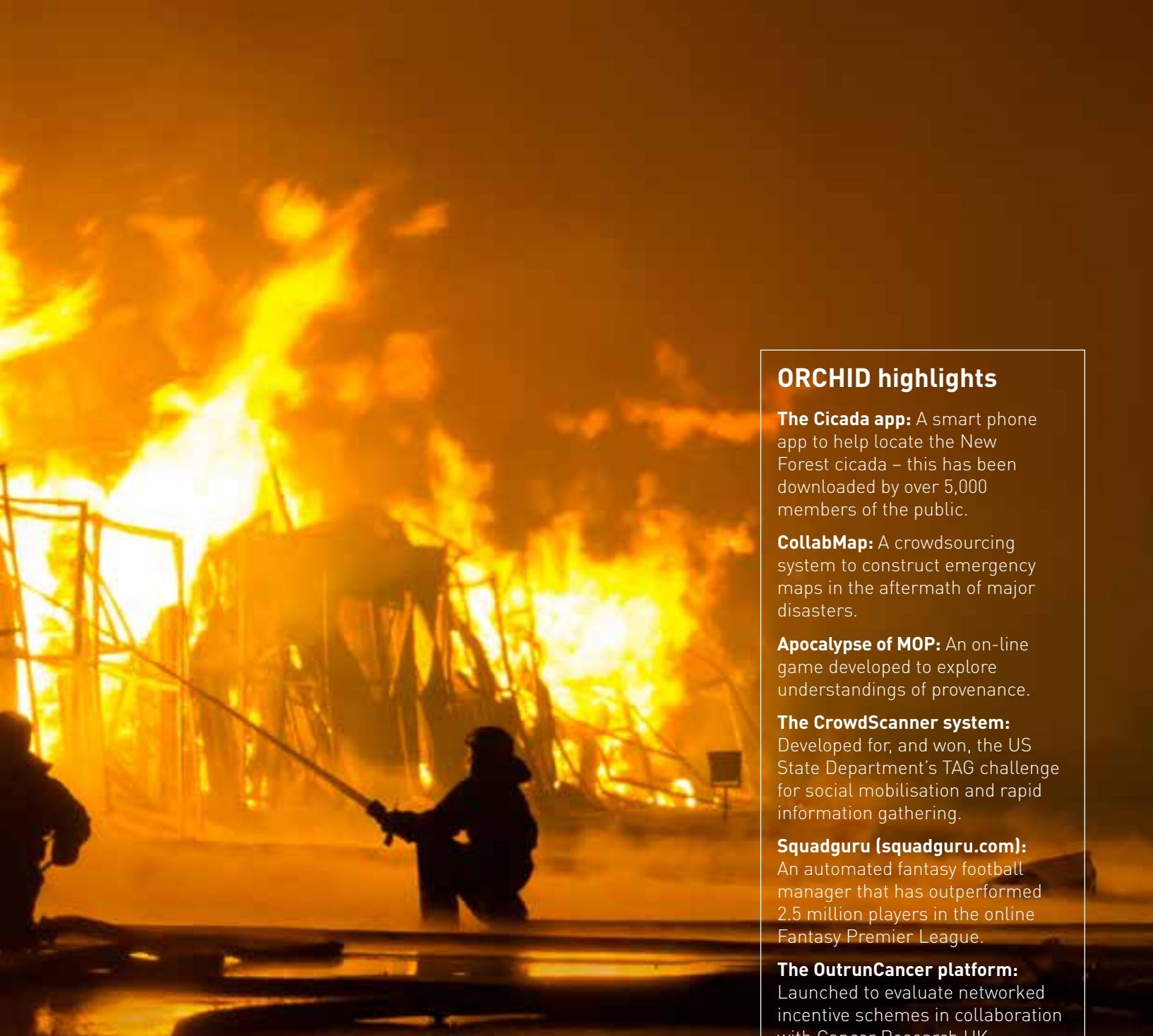
"By flexibly combining the best of human ingenuity and problem-solving with machine intelligence we can hope to build the complex socio-technical systems required by tomorrow's applications."

A case in point is the project's development and testing of new systems to support the management and coordination of disaster response. Faced with disaster situations such as earthquake, forest fire or flooding, rescue services have to make critical decisions, often drawing on uncertain information and within a rapidly changing context. Where are the casualties? Where are the resources? How is the situation changing? ORCHID researchers developed systems that can collate, interrogate and manage information drawn from a variety of sources including social media, CCTV and crowdsourcing.

Among numerous success stories, a team of ORCHID researchers from the University of Southampton designed a new tool to help monitor national radiation levels in the aftermath of the 2011 nuclear accident at Fukushima-Daiichi in Japan. The technology they created intelligently harnessed the power of crowdsourced data from private individuals who deployed 577 Geiger counters across the country to help the public track the spread of airborne radioactive particles. To identify accurate information from so many sources, the platform combines reports from thousands of sensors and uses machine learning algorithms to correct for inconsistencies and weed out defective sensors.

ORCHID's crowdsourcing/citizen science-based technology was subsequently applied to a real-world disaster response situation with Rescue Global immediately following the earthquake in Nepal in 2015.

In the field of smart energy, ORCHID research led to Joulo, a spin-out company whose technology provides 'clever' insight into heating systems, allowing customers to save money on their energy bills and make their homes more comfortable. Joulo was tipped as the UK's brightest home tech start-up when it won first place at the 2013 British Gas connecting homes competition.



A key element of ORCHID was the swift transfer out of the lab and into the marketplace. BAE Systems' Knowledge Transfer Officer, Dr David Nicholson, says: "You can do the research in the universities and build demonstration systems, but getting research into real products and systems is difficult. In ORCHID we've gone a long way to close that technology readiness gap."

Although ORCHID has now finished, its research agenda and research network continue to flourish. ORCHID directly trained and employed 50 researchers and doctoral students and has spawned 30 follow-on projects worth £15 million stretching beyond the initial universities and partners. The project has also established a new multidisciplinary research community and deployed real-world applications of human-agent collectives that will endure and be further developed.

In September 2016, in the latest from a long list of international prizes and accolades, the ORCHID project won the top prize in the Data and Connectivity category at *The Engineer* magazine's Collaborate to Innovate Awards.

ORCHID highlights

The Cicada app: A smart phone app to help locate the New Forest cicada – this has been downloaded by over 5,000 members of the public.

CollabMap: A crowdsourcing system to construct emergency maps in the aftermath of major disasters.

Apocalypse of MOP: An on-line game developed to explore understandings of provenance.

The CrowdScanner system: Developed for, and won, the US State Department's TAG challenge for social mobilisation and rapid information gathering.

Squadguru (squadguru.com): An automated fantasy football manager that has outperformed 2.5 million players in the online Fantasy Premier League.

The OutrunCancer platform: Launched to evaluate networked incentive schemes in collaboration with Cancer Research UK.

GalaxyZoo: ORCHID technology is used in a large-scale project of galaxy research; classifying millions of galaxies.

SharedTask App: An award-winning crowdsourcing app that aims to classify tweets. Developed in collaboration with Microsoft Research.

Hire and Fire for TREC: A crowdsourcing app that helps recruiters to detect trustworthy and capable workers.