G. J. Hutchings

*The author presented on this page has recently published his **10th article** in Angewandte Chemie in the last 10 years:*
"The Direct Synthesis of Hydrogen Peroxide Using Platinum-Promoted Gold–Palladium Catalysts": J. K. Edwards, J. Pritchard, L. Lu, M. Piccinini, G. Shaw, A. F. Carley, D. J. Morgan, C. J. Kiely, G. J. Hutchings, *Angew. Chem.* **2014**, *126*, 2413–2416; *Angew. Chem. Int. Ed.* **2014**, *53*, 2381–2384.

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Education:	1972 BSc in Chemistry, University College London 1975 PhD with Charles Vernon, University College London 2002 DSc, University of London
Awards:	**2006** François Gault Lecturer (EFCATS); **2009** elected Fellow of the Royal Society; **2010** elected member of the Academia Europaea; Founding Fellow of the Learned Society of Wales; **2011** IPMI Henry J. Albert Award; France–Great Britain Chemistry Prize; **2012** Alwin Mittasch Award (Dechema); Heinz Heinemann Award (IACS); Thompson Reuters Citation Laureate; **2013** Royal Society Davy Medal
Current research interests:	I am interested in the characterization and study of gold nanocrystals and nanoalloys as heterogeneous catalysts, and the design of selective oxidation and hydrogenation catalysts. The main goal is designing novel heterogeneous catalysts for challenging reactions, and I am particularly interested in the partial oxidation of methane to methanol and the direct synthesis of hydrogen peroxide. These two reactions are conceptually very simple but experimentally pose significant problems.
Hobbies:	Walking, wine; I also like gardening and drawing but I do not seem to get the time.

My motto is … never give up!

In a spare hour, I … read a newspaper.

My favorite quote is … "Experiment is the only means of knowledge at our disposal. Everything else is poetry, imagination" by Max Planck; but I have many others such as "We are such stuff as dreams are made on, and our little life is rounded with a sleep" from *The Tempest* by Shakespeare.

I advise my students to … have lots of ideas. You need lots of ideas as many will not work.

The secret of being a successful scientist is … to recognize when you have been lucky. Many discoveries are made by chance and you need to be able to recognize this and make the most of the new direction.

The most important thing I learned from my students is … be enthusiastic; it's a privilege to supervise young scientists, it keeps you young.

My favorite author (science) is … Richard Feynman. His book *Surely You're joking, Mr Feynman! (Adventures of a Curious Character)* is a must-read book for everyone.

My favorite painter is … Wassily Kandinsky. Particularly the Blue Rider period; and *Color Studies* is one of my favorites.

My favorite composer is … Joaquín Rodrigo and the *Concierto de Aranjuez* is my favorite.

My favorite book is … *The Return of the Native* by Thomas Hardy as this reminds me of Dorset, the county of my birth.

The natural talent I would like to be gifted with … being able to speak a foreign language. It would have been nice but it's a bit late now.

My favorite drink is … a glass of chilled sauvignon blanc in the early evening.

When I was eighteen I wanted to be … a chemist, in fact I wanted to be a chemist when I was 11 and did my first experiment.

My first experiment was … the distillation of water. I tried to copy what I had seen in class but made a small mistake and blew it up in my mother's kitchen! I was hooked, I discovered that science was fun and I never looked back, but future experiments were in the garden shed!

Has your approach to publishing your results changed since the start of your career?

I took up my first academic post at the age of 34 after 9 years in industry. At that time I had one paper from my PhD but I had changed fields from biological chemistry to heterogeneous catalysis. I was therefore very keen to publish and initially I wrote a lot of communications, which fragmented the work. Now I realize this is not a sound approach as the scientific community wants to see the complete story. Now I often take a long time over key publications and in the case of the papers I highlight below, some of these took many years of research after we got the initial results before we managed to complete the study (e.g., this took 4 years for paper 5). One has to learn to be patient and not worry that others may get there before you, but to date, luckily, this has not been the case.

What do you think the future holds for your field of research?

I am really excited about the future for catalysis. Many view heterogeneous catalysis as underpinning the chemical and petrochemical industries, and of course this will continue. In this respect, catalysis will play a key role in trying to solve some of the key challenges such as carbon dioxide utilization and making processes greener. However, I am keen that heterogeneous catalysis gets applied in new areas. For example, an area that I am keen to expand is water purification so that water can be reused in commercial and domestic applications. In the future, water will be a sought-after commodity, although having lived through the wettest winter on record in the UK, many might not agree! But in the near future I see catalysis playing a key role in the provision of clean water and also clean energy.

My 5 top papers:

1. "Vapour Phase Hydrochlorination of Acetylene": Correlation of Catalytic Activity of Supported Metal Chloride Catalysts: G. J. Hutchings, *J. Catal.* **1985**, *96*, 292 – 295.
   This is the paper about my "eureka" moment in gold catalysis. I was working in industry in South Africa in 1982 and I was trying to find a better catalyst than mercuric chloride for acetylene hydrochlorination. I used data from a previously published paper to construct a correlation between activity for this reaction and the standard electrode potential, which predicted gold to be the best catalyst; and subsequently, I showed this to be the case. At the time it was counterintuitive that gold would be the best catalyst for any reaction. It also shows how valuable it is to read the literature.
2. "Tunable gold catalysts for selective hydrocarbon oxidation under mild conditions": M. D. Hughes, Y.-J. Xu, P. Jenkins, P. McMorn, P. Landon, D. I. Enache, A. F. Carley, G. A. Attard, G. J. Hutchings, F. King, E. H. Stitt, P. Johnston, K. Griffin, C. J. Kiely, *Nature* **2005**, *437*, 1132 – 1135.
   In this paper, we showed that supported gold nanoparticles could be active for solvent-free epoxidation of cyclic alkenes using liquid-phase reactants. Although we could get reactivity with O_2 we found that peroxides could aid the reaction. This paper showed that you could use supported gold nanoparticles for selective oxidation under mild conditions and furthermore that the solvent, if needed, could play an important role in controlling selectivity.
3. "Solvent-Free Oxidation of Primary Alcohols to Aldehydes Using Au – Pd/TiO_2 Catalysts": D. I. Enache, J. K. Edwards, P. Landon, B. Solsona-Espriu, A. F. Carley, A. A. Herzing, M. Watanabe, C. J. Kiely, D. W. Knight, G. J. Hutchings, *Science* **2006**, *311*, 362 – 365.
   This paper showed the synergistic effect of adding gold to palladium and also the link between catalysts that are active for the direct synthesis of hydrogen peroxide and the oxidation of alcohols. The increase in activity observed when the two metals were combined as alloys in supported nanoparticles was a factor of 27, and this paper highlighted the fact that bimetallic nanoalloys can be very effective redox catalysts.
4. "Gold Catalysis": A. S. K. Hashmi, G. J. Hutchings, *Angew. Chem.* **2006**, *118*, 8064 – 8105; *Angew. Chem. Int. Ed.* **2006**, *45*, 7896 – 7936.
   In 2005, Stephen suggested that we write a joint review on gold catalysis. I have to say this seemed like an excellent idea as we could highlight the advances in both homogeneous and heterogeneous catalysis with gold as well as the interplay between these two fields. It was a lot of work but great fun, and I can now say thank you to Stephen very publicly for his great suggestion.
5. "Switching Off Hydrogen Peroxide Hydrogenation in the Direct Synthesis Process": J. K. Edwards, B. Solsona, E. Ntainjua N, A. F. Carley, A. A. Herzing, C. J. Kiely, G. J. Hutchings, *Science* **2009**, *323*, 1037 – 1041.
   While we had published many papers on gold – palladium supported nanoalloys for the direct synthesis of hydrogen peroxide, in this paper we showed that it was possible to design a catalyst that catalyzed the synthesis of hydrogen peroxide but not its decomposition or hydrogenation. To make a material comprising two metals that did not decompose hydrogen peroxide marks a step change for this chemistry. To me this was a major discovery. It indicates that the active sites for synthesis and decomposition can be different and this paves the way to making catalysts that one day might be useful commercially.

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