

# CYCLOTRON, PSYCHLOTRON – WHAT'S IN A NAME?

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## Abstract

The names given to accelerators and their parts inspire some rambling reflexions, as do those of places and people associated with the MSU and Berkeley cyclotrons.

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*What's in a name? That which we call a rose  
By any other name would smell as sweet.*

So Shakespeare expresses the thoughts of Juliet, when she hears that Romeo's surname is Montagu – that of the long-standing enemies of her family.

Ladies and gentlemen: as you sit, refuelled and refreshed in body, I hope that that literary allusion will help you to put any lighter thoughts aside and prepare yourselves for an evening of refreshment in mind as well. I know that you're a serious bunch and that I need pull no punches. From literature we will move on to languages, geography, history and politics; then to engineering, nutrition, medicine, and quackery; next to religion, philosophy, lexicography, and irony; and finally to accelerators, etymology, psychology and comparative philology. I think that will just about do for the evening. So get out your pads, and sharpen your pencils!

The names of things have always intrigued me, and those associated with accelerators are of course of special interest. But before delving into the technicalities of cyclotrons and psychlotrons, maybe we should start closer to home, in tribute to our hosts from Michigan State

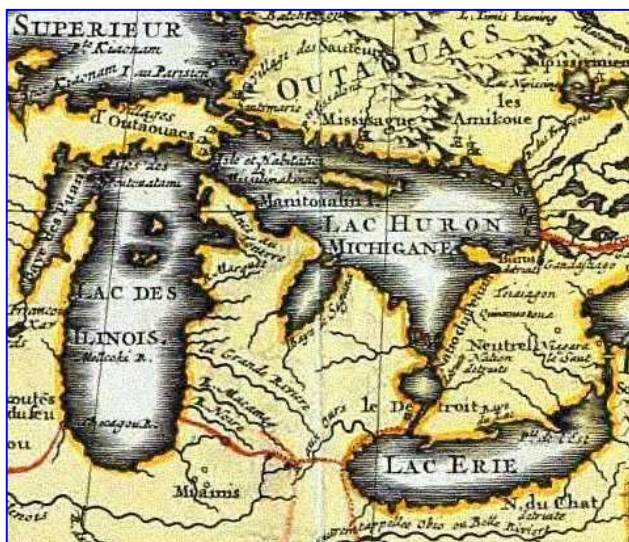


Figure 1: The Great Lakes, as named in 1733, showing *Chicagou R(ivière)* and *le Détroit*, from Guillaume de l'Isle's *Carte de Canada ou de la Nouvelle France*. [Courtesy of the University of Illinois Library]

University. You will probably have heard that the state's name derives from an Indian word *Michigama*, meaning great lake – that great lake to the west separating us from Chicago and more westerly states. In fact, the very pronunciation of *Mishigan* and *Shicago* reminds us of the history of the region – that the first European explorers were French trappers and missionaries, and that for almost a hundred years this region was part of *la Nouvelle France*. You may think it remarkable that the French pronunciation has been retained, and that 240 years of English-speaking settlement has not resulted in its being corrected to *Mitchigan* and *Tchicago*. That it has not perhaps suggests that the spoken word was more familiar than the written in this frontier region. If so, the remarkable thing is not the retention of the pronunciation, but that of the spelling.

The name of another local French settlement, *Fort du Détroit*, referring to the 100-km strait or channel between Lakes Huron and Erie, has not fared so well. In the process of rising to become one of the most populous and prosperous cities in the United States, its name has unhappily been reduced to *D'troyt* – sounding almost as if it was “Destroyed”. Perhaps the acute accent was too much. At least its founder, Antoine Cadillac, is recognizably immortalized in a town to the north of us, and by the most luxurious of American cars. I wonder if he came from Limousin?\*

When Michigan became a territory in 1805, Detroit was designated its capital and seat of government, and remained so when statehood was declared in 1816. But in 1847 it was decided to move the capital, and the legislators rather curiously decided on Lansing, which at that time was said to consist of only one log cabin and a saw mill, situated in a “howling wilderness”. An explanation for this strange decision is provided by the Web site “History of Lansing” – namely that “the politicians (were) worried about invasion from Canada”. Although such aggressiveness seems extremely un-Canadian, the fact that the story appears on the MSU Web server makes it very difficult for me to challenge here.

Lansing is also famous for car manufacturing – until recently commemorating the name of Mr. Olds in the Oldsmobile. But there is another famous name associated with Lansing, and MSU in particular, which has become very familiar to us this week – especially this evening as we enjoy the nutritious delights of the Kellogg Center.

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\* In fact he did not. The term limousine apparently first referred to cars with the luxury of an overhead canopy, and stems from the large capes worn by drivers of wagons in Limousin.



Figure 2: Dr. John H. Kellogg (left) and his younger brother Will (right). [Courtesy of The Detroit News]

This enterprise and many other charitable ventures of the Kellogg Foundation have of course been financed out of the fortune accumulated from the manufacture of breakfast cereals by Will Keith Kellogg, the gentleman whose slightly intimidating portrait welcomes us in the entrance lobby. In fact, the credit for inventing cornflakes, granola, peanut butter and so on, belongs more to his elder brother John Harvey Kellogg, who for over 60 years directed and developed the Seventh Day Adventist Sanitarium (more recently the Battle Creek Health Center) at Battle Creek, 80 kilometres south-west of here.

John was a truly heroic character, celebrated in the 1994 film *The Road to Wellville*, starring Anthony Hopkins. He believed that the digestive system was central to good health, and his treatments therefore emphasized special diet (vegetarian, low calorie) and thorough cleansing of the bowels – from both above and below – helped by mechanical aids such as vibrating chairs – though I will spare you further details while we still sit at table. He also advocated avoidance of smoking and sex, and, although married, reputedly practised what he preached. His enthusiasm for offbeat therapies, including radium cures, might also concern us today, but in his time he built up a



Figure 3: The Battle Creek Sanitarium in 1933. [Courtesy of the Willard Public Library, Battle Creek]

successful and fashionable practice at Battle Creek, and wrote almost 50 books in support of his theories. For these he was no bad advertisement: he remained active right up to his death (like his brother) at the age of 91.

Oddly enough, in cyclotrons we also have an example of two famous brothers, one also a medic and also named John H., the other Ernest – the Lawrences. Their lives, though, were not as colourful, and what they did is too well known to this audience to require repeating here. But that thought does bring us to the other centre of US cyclotron culture, Berkeley – or *Bahkly*, as I hope to teach you to say it. For it was named after George Berkeley, the famous Irish philosopher and bishop, who pronounced it that way. Like several other British names (Berkshire, Derby, Hertford, Jervis, Kerr, ...) and the occupations of clerk and sergeant, the spelling was fixed at *er* before the *r* was silenced and the pronunciation changed to long *ah* in the wholesale shift in English vowel sounds in the 15<sup>th</sup> and 16<sup>th</sup> centuries.

The essence of Berkeley's philosophy was that "to be is to be perceived" – external objects only exist when they are observed. This "subjective idealism" has provoked puzzlement, if not disbelief – for instance in Ronald Knox's famous limerick:

*There was once a man who said ``God  
Must think it exceedingly odd  
If he finds that this tree  
Continues to be  
When there's no one about in the quad''.*

To which the anonymous answer was:

*Dear Sir, Your astonishment's odd.  
I am always about in the quad.  
And that's why the tree  
Will continue to be,  
Since observed by Yours faithfully, God.*

Berkeley's view was rejected even more energetically by Dr. Samuel Johnson (of the dictionary). When his biographer, James Boswell, suggested that it was impossible to refute Berkeley's doctrine, "I shall never forget the alacrity with which Johnson answered, striking his foot with mighty force against a large stone, till he rebounded from it, 'I refute it thus' " – an attitude that will surely appeal to any physicist or engineer.

The Californians' choice of his name, however, seems not to have been driven so much by his fame as a philosopher, or even as a mathematician (for his criticism of the logical foundations of calculus), as in honour of his scheme to build a town and college in Bermuda "to convert the savage Americans". His enthusiasm for the new continent's potential not only led him to adventure to New England from 1728-31 in support of his scheme, but even inspired him to verse:

*Westward the course of empire takes its way;  
The first four acts already past,  
A fifth shall close the drama with the day;  
Time's noblest offspring is the last.*



Figure 4: Bishop George Berkeley (1685-1753).

In retrospect, it seems doubly ironic that this orthodox Christian and subjectivist philosopher should be commemorated by a university which has become famous on the one hand for its free thinking, and on the other for its scientific successes in determining an objective structure for matter. And its members don't even pronounce his name right!

Now perhaps it's time to turn from the names of places and people to those of the accelerators themselves. The word accelerate is of course familiar in physics, coming direct from Newton's mechanics and the Latin verb to speed up, and more distantly from the adjective *celer*, fast or swift. Incidentally, it has no connexion to celery, which the Romans spelt with an *s* and which has no special speeding effects – on the bowels or anything else.

The term cyclotron was at first just laboratory slang, and it took five years before Lawrence and his collaborators dared to use it in print to replace the cumbersome “magnetic resonance accelerator”. The *cyclo-* stem was an obvious choice, coming, via Latin, where *c* was pronounced hard and *y* was short, from the Greek *κύκλος* for circle. The suffix *-tron* is more interesting and apparently derives from the various electronic devices (kenotron, magnetron, thyatron, ..... ) then recently invented. These names were presumably supposed to echo electron, but they rather strangely steal just the last two letters of the Greek stem *ηλεκτρ-* and join them to the Greek neuter ending *-ov*, which Faraday had used in coining that first Greek atomic particle, the ion.

Anyhow *-tron* has prospered and we are now blessed with betatron, microtron, and synchrotron (and for the Russians, phasotron) – all strictly Greek you notice. Perhaps it was as well they did not use Latin, or synchronous (meaning together-timed) accelerators would have had to be called con-tempo-trons, which has a good up-to-date ring about it (forgive the double pun), but would have been dangerously close to contempt-ron.

Nevertheless the Latin word for a circle, *orbis*, and its Germanic counterpart *hring*, have not been neglected in accelerator physics, and *hring* has also been a prolific source of English words in general - not only ring, but also the rink on which icy sports are played, and the ranks or rows in which soldiers and taxis are drawn up (etymologists don't seem to feel the need to explain why a loopy concept should transfer so easily to a straight one); and thence to range (where the deer and the antelope play), and finally to ranch – which brings us right back to California.

As to the components of accelerators, their English names are mostly pretty functional – source, dee, tank, deflector, ... Only magnet has any romance to it, being named after Magnesia, a Greek colony in Asia Minor, the source of lodestones, the magnetic compasses of the ancients. Rather confusingly, its mines have also provided the names for magnesium and manganese.

Even when other languages are considered, most use English terms or literal translations. Even the word *dee* remains *dee* in most European languages. Only Spanish rejects such informality, preferring the precise though rather longwinded *electrodo hueco semicilindrico* – but then there aren't many Spanish cyclotrons.

Only in French does any native character show through – some *je ne sais pas quoi* – some class? To an English ear even straight translations into French sometimes add a touch of elegance. Thus a particle's rest mass becomes *masse en repos*, damping *amortissement*, necktie diagram *cravate de stabilité*, wavelength *longueur d'onde*. Only storage ring – *anneau de stockage* – brings one down to earth with its echoes of Chicago's cattle yards.

But there is always *l'amour* – never far away from the French mind – so instead of smooth approximation we have *approximation douce*, instead of photon production *conception des photons*, and above all, instead of magnet *aimant*, loving. The Italian, German, Dutch, Swedish and even Russian words all have the root magnet-, and indeed old French used *magnete*, from which the adjective *magnétique* survives. But to the French of later times the image of magnets clasping iron objects to them like lovers was apparently too much to go unremarked and uncelebrated – and so magnets are *les aimants*.

Finally, I would like to say a few words to introduce a completely new accelerator concept – the psychotron. Is this some fiendish machine devised by shrinks to speed up those well-known particles, the neurons, in mentally-challenged patients? Or does it belong to that weird menagerie of accelerator sound-alikes:

- the axle-aerator, a device to cool overheated axles, coming in many different shapes and sizes?
- the tandemonium, a musical instrument for two highly charged players, specially suited to modern music?
- the beat-a-tom, a Greek-African drum guaranteed to induce electric effects in rap group fans?
- the clinac, a sort of hospital for straightening out mad accelerator scientists?

No, none of the above. Since the initial *p* is silent (as in Psmith, Jeeves's equally resourceful precursor in P.G. Wodehouse's earlier novels), you may wonder if the psychotron's closest relation is not its homophone, the cyclotron. Indeed it is. It is just the cyclotron you have in your mind – that ideal machine which is free from all those troublesome practical limitations – spatial conflicts, inadequate materials, space-charge forces, sparking limits, ... – that make it so difficult to achieve the performance that you dream of.

In short, it's your Dream Machine.