The Roots of Lisp

(I wrote this article to help myself understand exactly  
what McCarthy discovered. You don't need to know this stuff  
to program in Lisp, but it should be helpful to   
anyone who wants to  
understand the essence of Lisp  both in the sense of its  
origins and its semantic core. The fact that it has such a core  
is one of Lisp's distinguishing features, and the reason why,  
unlike other languages, Lisp has dialects.)In 1960, John   
McCarthy published a remarkable paper in  
which he did for programming something like what Euclid did for  
geometry. He showed how, given a handful of simple  
operators and a notation for functions, you can  
build a whole programming language.  
He called this language Lisp, for "List Processing,"  
because one of his key ideas was to use a simple  
data structure called a list for both  
code and data.It's worth understanding what McCarthy discovered, not  
just as a landmark in the history of computers, but as  
a model for what programming is tending to become in  
our own time. It seems to me that there have been  
two really clean, consistent models of programming so  
far: the C model and the Lisp model.  
These two seem points of high ground, with swampy lowlands  
between them. As computers have grown more powerful,  
the new languages being developed have been moving  
steadily toward the Lisp model. A popular recipe  
for new programming languages in the past 20 years   
has been to take the C model of computing and add to  
it, piecemeal, parts taken from the Lisp model,  
like runtime typing and garbage collection.In this article I'm going to try to explain in the  
simplest possible terms what McCarthy discovered.  
The point is not just to learn about an interesting  
theoretical result someone figured out forty years ago,  
but to show where languages are heading.  
The unusual thing about Lisp  in fact, the defining  
quality of Lisp  is that it can be written in  
itself. To understand what McCarthy meant by this,  
we're going to retrace his steps, with his mathematical  
notation translated into running Common Lisp code.