


Why Are They Named Lambdas?

Why Are They Named *Lambdas*?


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A little about me


- B.A. (math's); M.S., Ph.D. (computer science).
- Professional programmer for over 50 years, programming in C++ since 1982.
- Experienced in industry, academia, consulting, and research:
 - Founded a Computer Science Dept.; served as Professor and Dept. Head; taught and mentored at all levels.
 - Managed and mentored the programming staff for a reseller.
 - Lectured internationally as a software consultant and commercial trainer.
 - Retired from the Scientific Computing Division at Fermilab, specializing in C++ programming and in-house consulting.
- Not dead — still doing training & consulting. (Email me!)



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Emeritus participant in C++ standardization

- Written >160 papers for WG21, proposing such now-standard C++ library features as `gcd/lcm`, `cbegin/cend`, `common_type`, and `void_t`, as well as all of headers `<random>` and `<ratio>`.
- Influenced such core language features as *alias templates*, *contextual conversions*, and *variable templates*; recently worked on *requires-expressions*, *operator<=>*, and more!
- Conceived and served as Project Editor for *Int'l Standard on Mathematical Special Functions in C++* (ISO/IEC 29124), now incorporated into C++17's `<cmath>`.
- Be forewarned: Based on my training and experience, I hold some rather strong opinions about computer software and programming methodology — these opinions are not shared by all programmers, but they should be! ☺




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We owe much to these pioneers of computation ...




Alan Turing
1912-1954




Emil Post
1897-1954



Alonzo Church
1903-1995




Kurt Gödel
1906-1978




Stephen Kleene
1909-1994

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... As well as to these pioneers of computation




Andrey Markov, Jr.
1903-1979



Axel Thue
1863-1922



Bertrand Russell
1872-1970




Alfred Whitehead
1861-1947

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From theory to practice

- They researched the foundations of mathematics:
 - Eventually their respective works largely converged into a branch of math's known as computability theory.
 - But Church's notation became the foundation of the LISP programming language (McCarthy, 1958).
- "Lisp is today's equivalent of Latin. Educated people are supposed to have studied and forgotten it."



— Peter Dimov,
Simple C++11 metaprogramming,
2015

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Functional programming lives on

- In such higher-order programming, a function is not only callable, but is a copyable value, too:
 - In C++, function objects have always fit this description, ...
 - So C++11 introduced lambdas as “a concise way to create a simple function object” (see [expr.prim.lambda]/1).
 - And, as we know, they’ve evolved ever since.
- Many consider that “the untyped λ -calculus was the first object-oriented language.”



— William R. Cook,
On Understanding Data Abstraction, Revisited,
OOPSLA 2009

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Origin of lambda as a term of art

- Today, math functions are named (e.g., $f(y) = 3y + 1$):
 - (It’s believed Leonhard Euler was first to do so [1734].)
- But Alonzo Church used (1930s) anonymous fctn def’ns (e.g., $\hat{y} . 3y + 1$) in his computing foundations work:
 - When published, the caret (hat, \wedge) was typeset separately (e.g., $\wedge y . 3y + 1$), resembling Greek’s capital Lambda ...
 - That later editors changed to lower case (e.g., $\lambda y . 3y + 1$).
- Such notation became known as lambda expressions., and the collected work became known as the lambda calculus.

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For more information

- Come on Friday afternoon:
 - Time: 13:30 (1:30 P.M.)
 - Room: Summit 8/9
 - Title: “From Functions to Lambdas:
How Do C++ Callables *Really* Work?”
 - Speaker: Yours Truly
- I hope to see you there.
- Thank you!

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FIN

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