

Doing with images makes symbols

Alan Kay

[Jean Piaget](#), pioneering work in child development

1962, [MIT Lincoln Laboratory](#):

[Wesley Clark](#): first personal computer

[Ivan Sutherland's](#) PhD thesis 1963 [Sketchpad](#):

object-oriented programming, concept of graphical user interfaces (GUIs)

[Xerox Palo Alto Research Center](#) (= Xerox PARC), Palo Alto, California:

Smalltalk (language + object-oriented framework for GUI programming +
object-oriented programming environment)

GUIs, desktop paradigm, mouse, bitmapped displays

Ethernet

laser printing

key researchers: [Butler W. Lampson](#), [Alan Kay](#), [Charles P. Thacker](#),
[Adele Goldberg](#)