

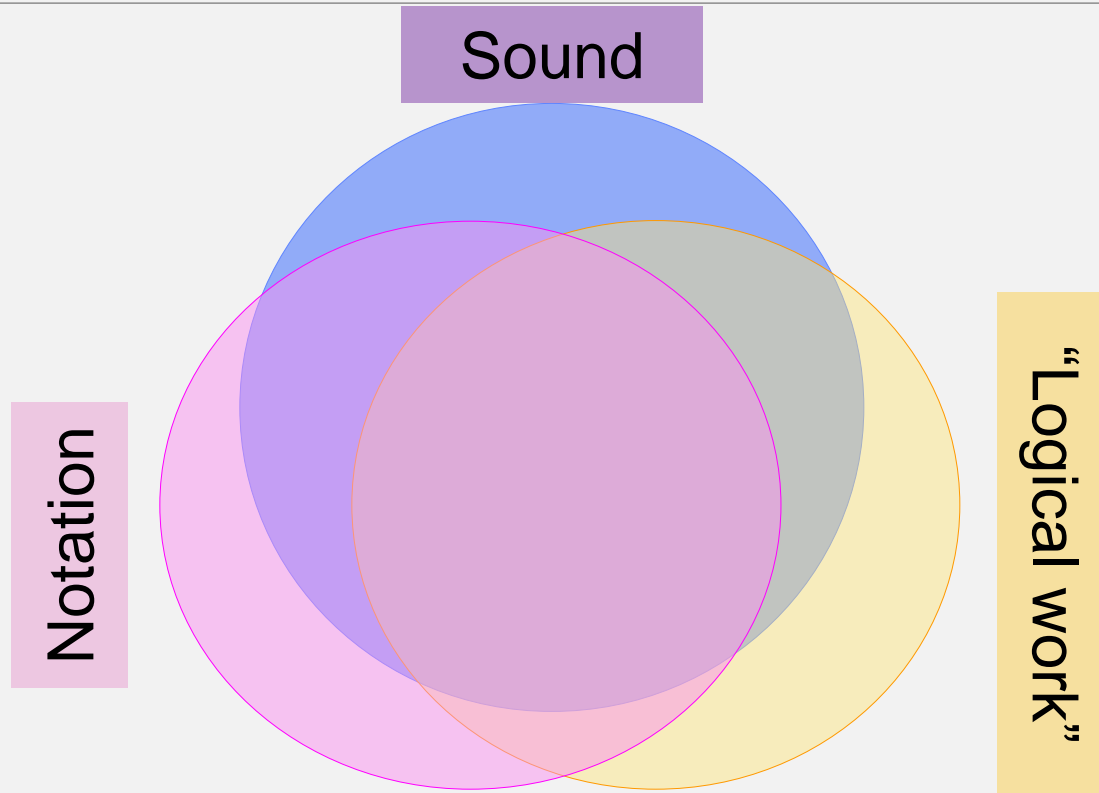
An Introduction to SCORE

MUSIC 253/CS 275A

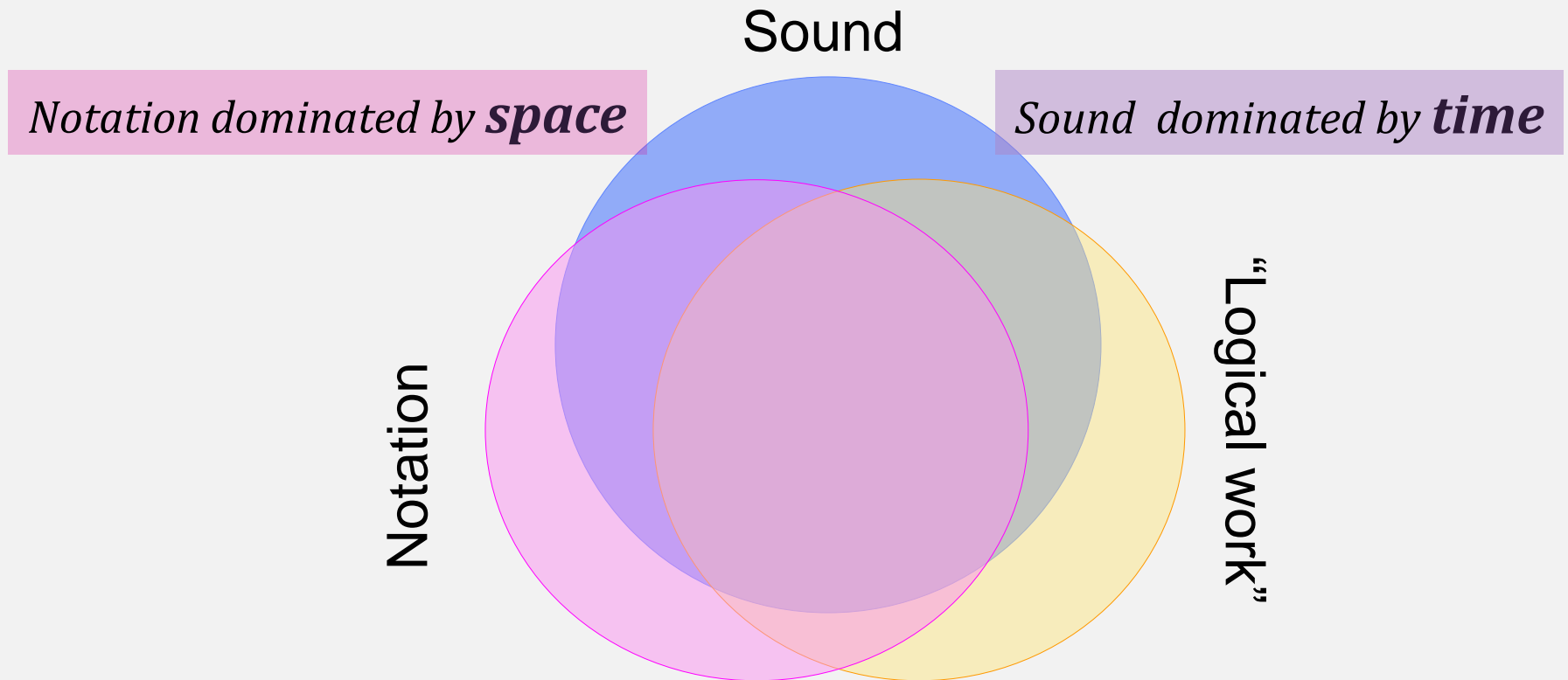
STANFORD UNIVERSITY



The Graphics (*Notation*) Domain



The Graphics Domain



The Graphics Domain: Basic Principles

PITCH

Height on a staff

Pitch inflection

Marks (#, B, etc)

Pitch articulation

Marks (*staccato*, *tr*)

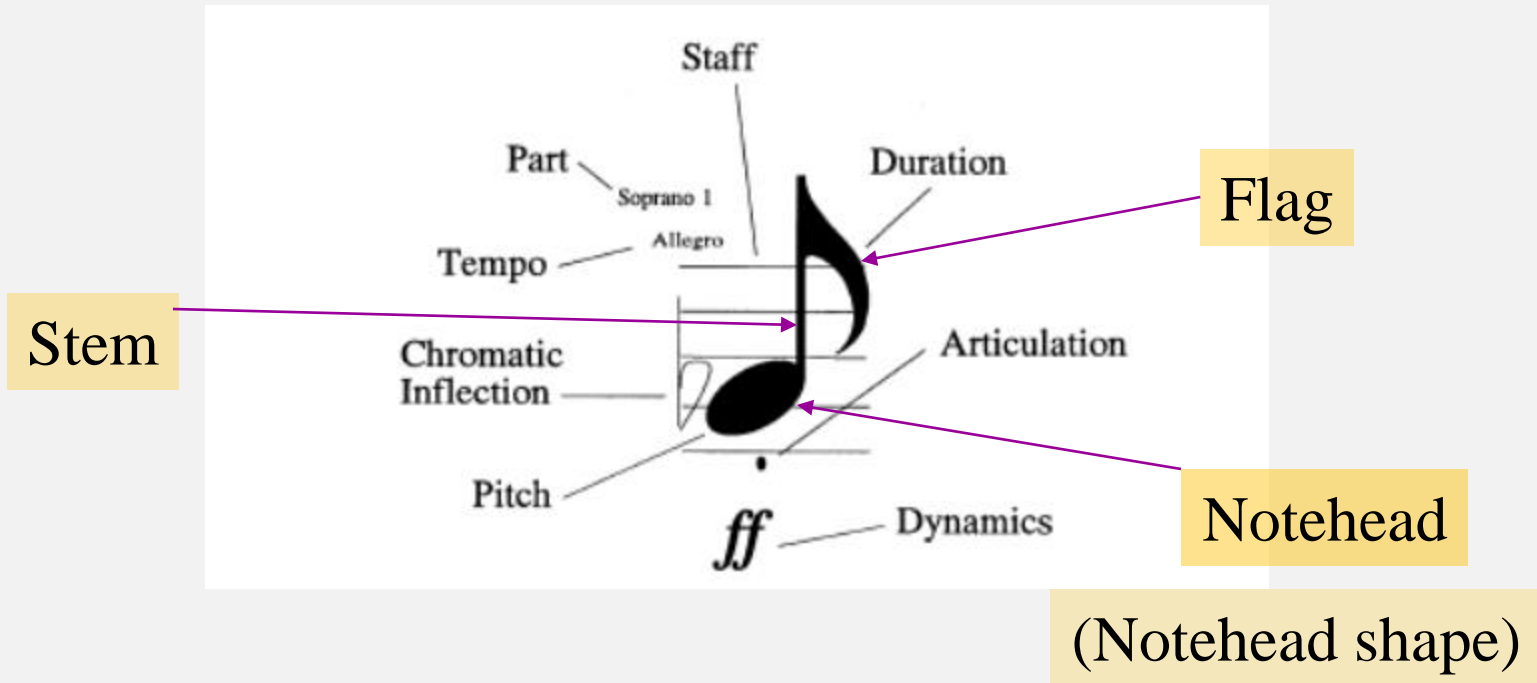
DURATION

Assembly of objects:

- Noteheads
- Stems and flags
- Beams
- Slurs

Value inferred from combinations of objects

SCORE's approach to the note



Essential Dictionary of Music Notation (1996; recommended): See <http://www.alfred.com/Products/Essential-Dictionary-of-Music-Notation--00-16638.aspx>

SCORE's approach to systems

Data-entry order

1. Encode lowest voice
2. Encode other voices on first system
3. Repeat until all systems are encoded
4. Assemble page(s)

Start here

The image displays a musical score with five staves. The staves are labeled from top to bottom: *clarinet in A*, *violino I*, *violino II*, *viola*, and *violoncello*. The *violoncello* staff is highlighted with a purple background. To the right of the staves, a vertical green box contains the numbers 5, 4, 3, 2, and 1, indicating the data-entry order from top to bottom. Below the first system, a second system of staves is shown, with a vertical line indicating a page break. The *violoncello* staff in the second system is also highlighted with a purple background.

5
4
3
2
1

Part/score orientation in SCORE

Process

1. Encode lowest voice
2. Encode other voices on first system
3. Repeat until all systems are encoded
4. Assemble page

Implications:
Content must be known in advance

The image displays a musical score snippet with five staves. The staves are labeled from top to bottom: *clarinet in A*, *violino I*, *violino II*, *viola*, and *violoncello*. The *violoncello* staff is highlighted with a purple background. The score shows a system of music with various notes, rests, and dynamic markings such as *f* and *pt=*. A vertical bar line is visible in the middle of the system.

SCORE input/editing system

ASCII (computer keyboard) input (next slide)

Parametric editing (2)

Two stages:

- Data entry
- Data editing

The screenshot shows the WinScore software interface. At the top, there is a menu bar with 'File', 'View', 'Format', and 'Help'. Below the menu bar is a table with columns for 'Item #', 'P1/11', 'P2/12', 'P3/13', 'P4/14', 'P5/15', 'P6/16', 'P7/17', 'P8/18', 'P9/19', and 'P10/20'. The table contains the following data:

Item #	P1/11	P2/12	P3/13	P4/14	P5/15	P6/16	P7/17	P8/18	P9/19	P10/20	
189/268	NOTE	1	5.0	60.05	13.00	10.00	0.000	0.250	3.500	0.000	0.000
			-5.250								

Below the table is a musical score for a piano piece. The score is in G major and 4/4 time. It features a treble and bass clef. The music includes dynamic markings such as *ff*, *mp*, and *f*. There are also tempo markings like '13' and '8', and a section marked '5:3'. The score is displayed on a grand staff with a brace on the left side.

SCORE input order

Pitch

Height on a staff

Pitch (names)

Pitch inflection

Marks (#, B, etc)

Rhythm (names)

Pitch articulation

Marks (staccato, tr)

Marks

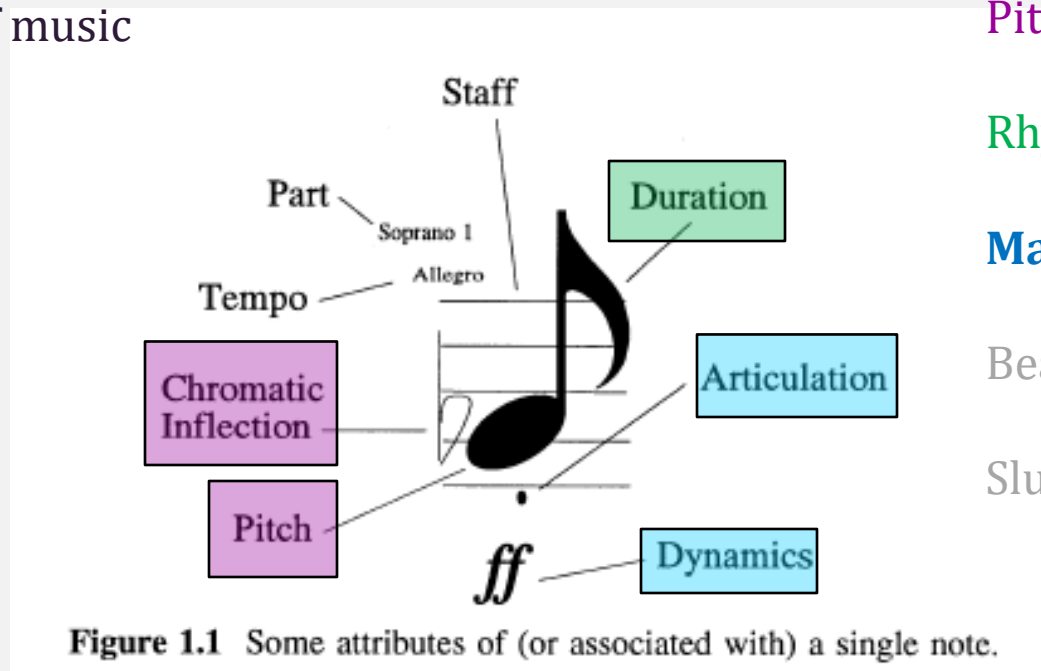
Duration

Beams (positions)

Slurs (positions)

Musical features of one note (SCORE)

A molecule of music



Pitch (names)

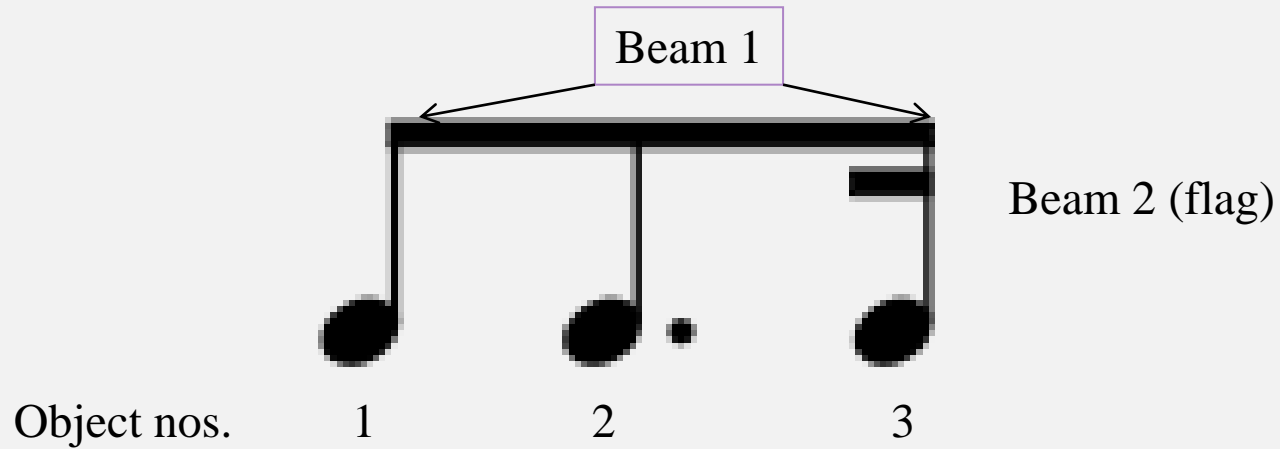
Rhythm (names)

Marks

Beams (positions)

Slurs (positions)

Object groups: (#4) beams



Object groups: (#4) slurs

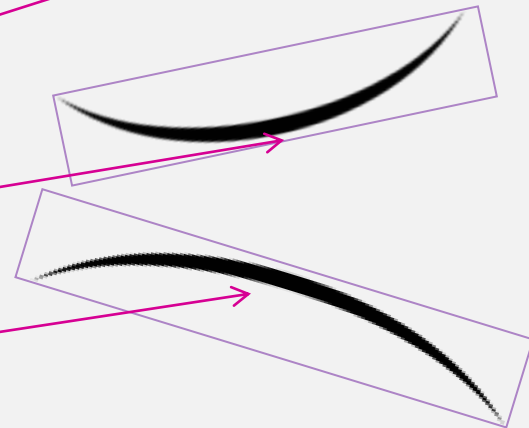
Beams vary by

- Length
- Inclination



Slurs vary by

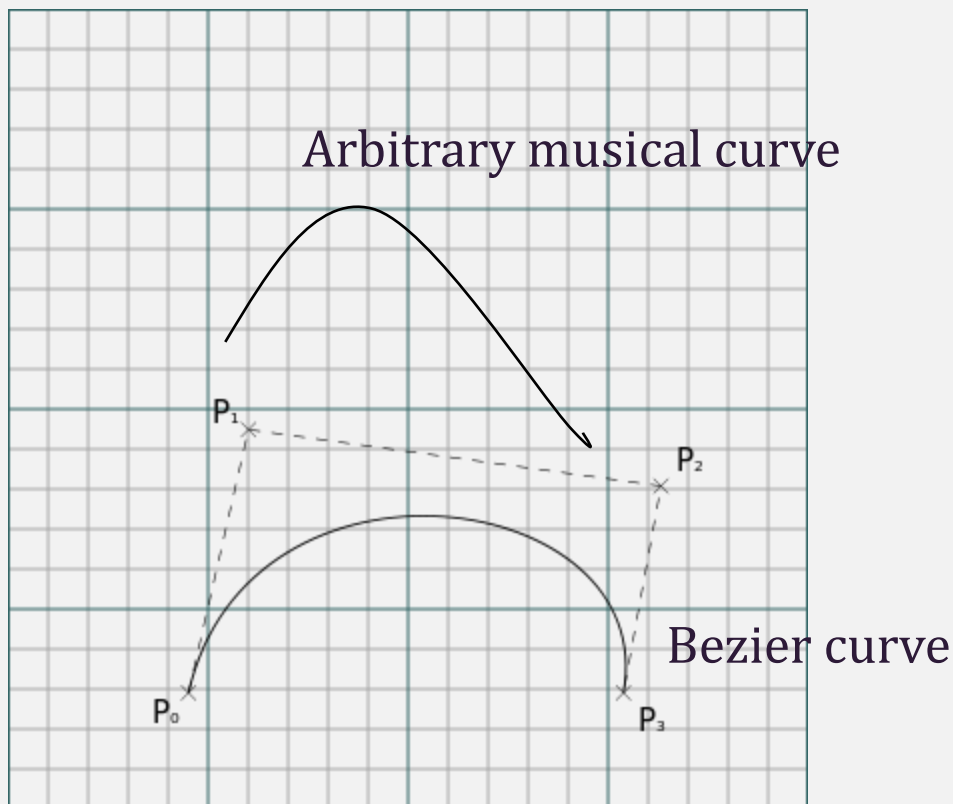
- Length
- Inclination
- Inversion
- Apex (nadir) of arc
(in relation to midpoint)



SCORE's imaginary grid

Slurs vary by

- Length
- Inclination
- Inversion
- **Apex (nadir) of arc**
(in relation to midpoint)



Symbolic codes: DARMS and SCORE

□ DARMS (1965)

- Columbia/Princeton/Yale
- **Theoretically** for notation
- One-pass **input** scheme
- Required **intermediate representation** for score assembly
- *Note Processor* (c.1986-92): only **commercial** program to use it [on PCs]
- **Legacy** = analysis

□ SCORE (1972)

- **Stanford/Bell Labs**
- **Actually** for notation
- Five-pass **input** scheme
- Required **intermediate representation** for score assembly
- **SCORE** (1972--): only **commercial** notation program to use it
- **Legacy** = collected works of major composers

Music V → SCORE

MUSIC V

SCORE

Max Mathews

Leland Smith

Bell Labs

Stanford

Sound-list generation

Note-list generation



GEN2	3	0.0	2	1	1	0	.5	0	.25	0	This statement defines an instrument. Here a wave-form table for the clarinet is set up. GEN2 calls an oscillator subroutine. The parameters are (1) an operation code [3 = generate function], (2) an action time, (3) an instrument number, (4) a table number, and (5-10) the relative amplitudes of harmonics 1..6.
NOT	1	2	0.0	.5	1	440					These statements cause notes to be played. The initial parameters are (1) an operation code [1 = play note], (2) an instrument number, (3) a start-of-action time, (4) event duration, (5) an absolute amplitude for the event, and (6) event frequency (Hz). These parameters may be followed by a variable number of user-defined parameters (not shown).
NOT	1	2	0.5	.5	2	554					
NOT	1	2	1.0	.5	3	660					
NOT	1	2	1.5	.5	4	554					
NOT	1	2	2.0	1.0	5	880					
NOT	1	2	3.0	.5	3	660					
NOT	1	2	3.5	.5	2	554					
NOT	1	2	4.0	.5	2	494					
NOT	1	2	4.5	.5	4	588					
NOT	1	2	5.0	1.0	5	740					

Example G1 Music V representation of Bars 1 and 2 of the *Clarinet* part of the Mozart trio.

SCORE/CCRMA: A Brief History



DC Power Lab site

Who? **Leland Smith (1925-2013)**

- Where? Stanford/CCMRA/Palo Alto
- Goal? engraving-quality music
- Method? ASCII input, screen editing

Who uses SCORE?

- Schott (DE)
- CF Peters (DE)
- Ricordi (IT)
- Hal Leonard (US)
- Composers in Stanford sphere

CCRMA pre-history c. 1974

John Chowning

Leland Smith



Photo: Patti Wood

Score vs MuseScore

SCORE

Pitch: reliable

Duration: reliable

MIDI playback: [pre-MIDI]

File import: little

Export: limited

System, score assembly: manual

Extensible symbol set: extensive

Fonts: beautiful; non-Roman available

MuseScore

Pitch: not always reliable

Duration: not always reliable

MIDI playback: yes

File import: MIDI, MusicXML, SCORE

Export: MusicXML

Score assembly: automatic*

Extensible symbol set: limited

Fonts: recently improved by “Leland”

Symbolic vs. MIDI-based notation

SCORE-type program

Pitch: reliable

Duration: reliable

MIDI playback: [partial]

File import: little

Export: limited

System, score assembly: manual

Extensible symbol set: yes

Finale-type program

Pitch: not always reliable

Duration: not always reliable

MIDI playback: yes

File import: MIDI, MusicXML, SCORE

Export: MusicXML

Score assembly: automatic

Extensible symbol set: partial