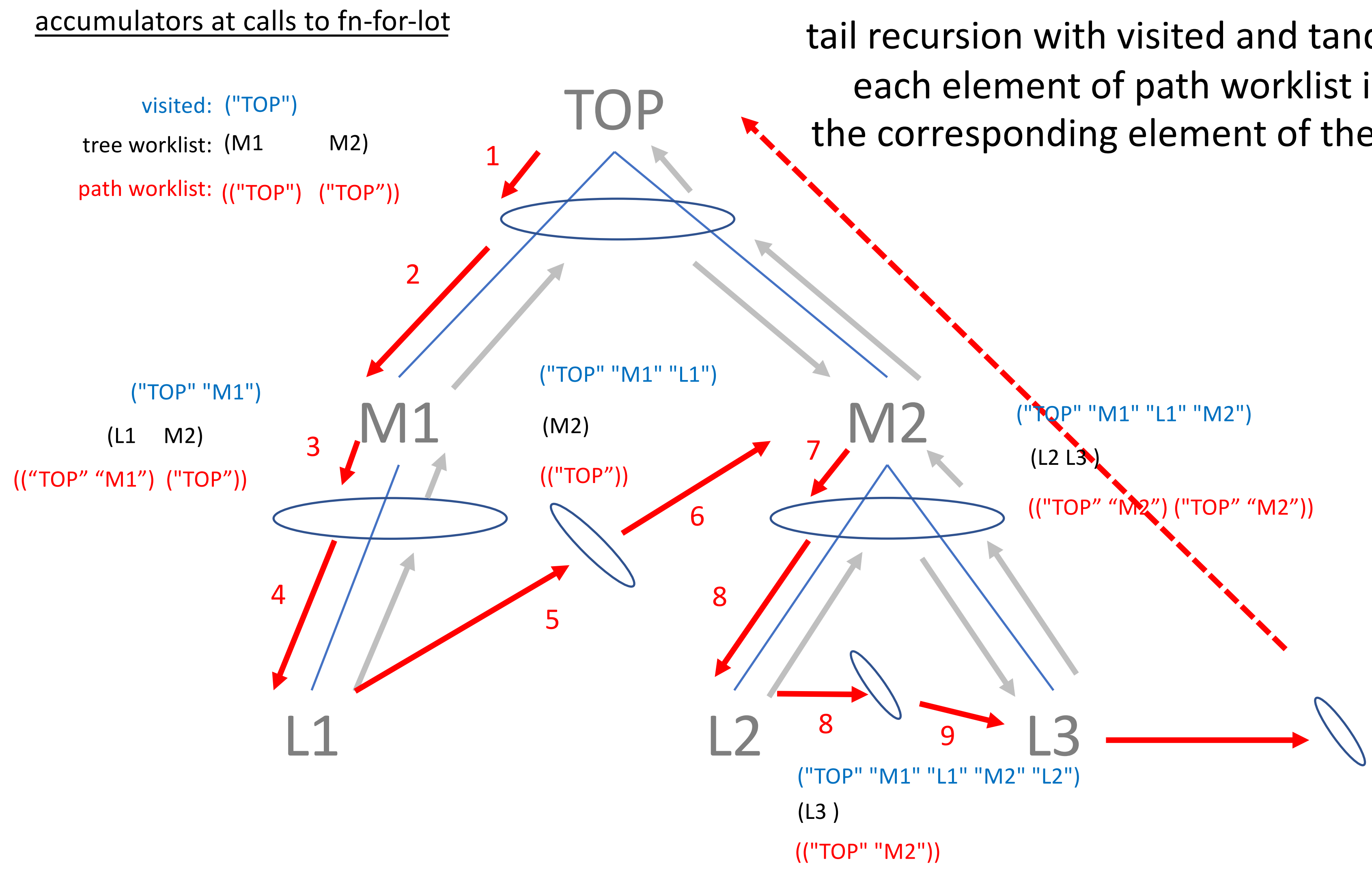
Lecture 21 pre-work

Review the following carefully

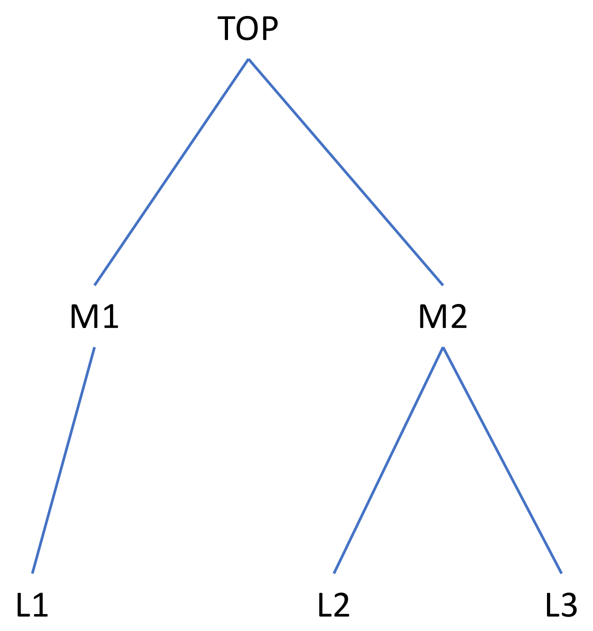
Our name	value	In SR code	In TR code
path	values from origin to node IN THE DATA	accumulates naturally along SR calls	requires tandem worklists
visited	values from origin to node in the computation	impossible	accumulates naturally along TR calls

tail recursion with visited and tandem worklists
each element of path worklist is the path for
the corresponding element of the tree worklist



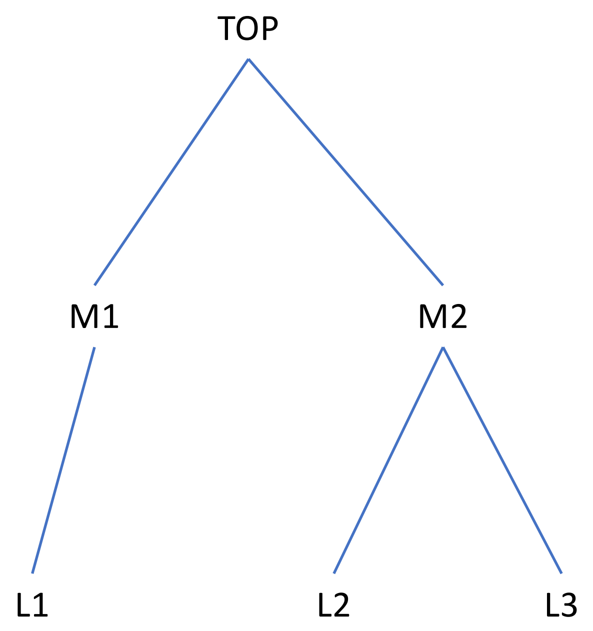
arb arity tree structural recursion templates

```
(@template Tree (listof Tree) encapsulated)

(define (fn-for-tree t)


  (local [(define (fn-for-t t)
            (local [(define name (node-name t))  ;unpack the fields
                    (define subs (node-subs t))] ;for convenience

              (... name (fn-for-lot subs))))



          (define (fn-for-lot lot)
            (cond [(empty? lot) (...)]
                  [else
                   (... (fn-for-t (first lot))
                        (fn-for-lot (rest lot)))]))]

    (fn-for-t t)))
```



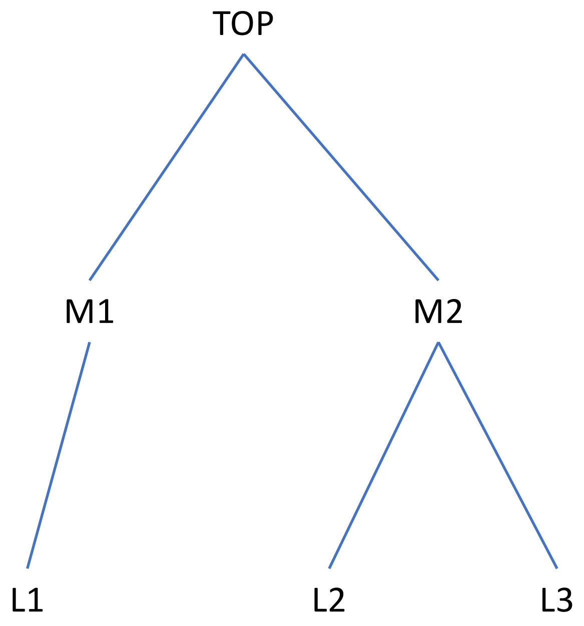
find-path: structural recursion with path accumulator.

```
(@template Tree (listof Tree) accumulator)

(define (find-path t n)
  ;; path is (listof String); names of ... grandparent, parent trees
  ;;                          (builds along recursive  calls)
  (local [(define (fn-for-t t path)
            (local [(define name (node-name t))
                    (define subs (node-subs t))
                    (define npath (append path (list name)))]
              (if (string=? name n)
                  npath
                  (fn-for-lot subs npath))))

          (define (fn-for-lot lot path)
            (cond [(empty? lot) false]
                  [else
                   (local [(define try (fn-for-t (first lot) path))]
                     (if (not (false? try))
                         try
                         (fn-for-lot (rest lot) path)))]))]


    (fn-for-t t empty)))
```



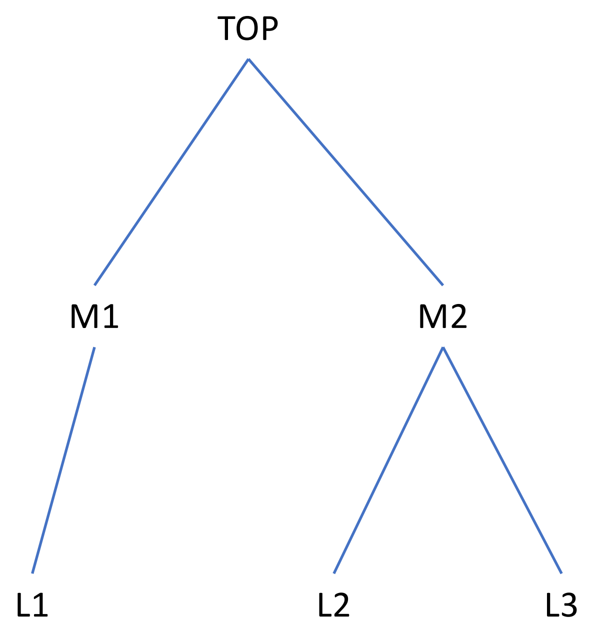
find-tree: tail recursion with worklist

```
(@template backtracking Tree (listof Tree) accumulator)

(define (find-tree t to)
  ;; t-wl is (listof Tree)
  ;; worklist of pending trees to visit
  (local [(define (fn-for-t t t-wl)
            (local [(define name (node-name t))  ;unpack the fields
                    (define subs (node-subs t))] ;for convenience
              (if (string=? name to)
                  t
                  (fn-for-lot (append subs t-wl)))))


          (define (fn-for-lot t-wl)
            (cond [(empty? t-wl) false]
                  [else
                   (fn-for-t (first t-wl)
                             (rest t-wl))]))]


    (fn-for-t t empty)))
```



tail recursion with tandem worklists (tree and path)

```
(@template backtracking Tree (listof Tree) accumulator)

(define (find-path t to)
  ;; t-wl is (listof Tree)
  ;; worklist of trees to visit (unvisited subs of already visited trees)
  ;;
  ;; p-wl is (listof (listof String))
  ;; worklist of paths to corresponding trees in t-wl
  ;;
  ;; visited is (listof String)
  ;; names of trees visited so far (builds along tail recursive calls)
  (local [(define (fn-for-t t path t-wl p-wl visited)
            (local [(define name (node-name t))
                    (define subs (node-subs t))
                    (define npath (append path (list name)))
                    (define nvisited (append visited (list name)))]
              (if (string=? name to)
                  npath
                  (fn-for-lot (append                           subs  t-wl)
                              (append (map (lambda (s) npath) subs) p-wl)
                              nvisited))))

          (define (fn-for-lot t-wl p-wl visited)
            (cond [(empty? t-wl) false]
                  [else
                   (fn-for-t (first t-wl)
                             (first p-wl)
                             (rest t-wl)
                             (rest p-wl)
                             visited)]))]

    (fn-for-t t empty  empty empty empty)))
```


TOP
M1
M2
L1
L2
L3