# LORRAINE G. ALLAN MEMORIAL GARDEN
## Dedicated September 20, 2013

The Lorraine G. Allan Memorial Garden incorporates features to remind us of Lorraine's research, her contributions to McMaster, and her family and friends.

## Research

Lorraine was a psychophysicist. Psychophysics is the study of the relationship between physical events and our internal experience of these physical events. One of the first people to investigate this topic was Ernst Weber. Weber's Law states that the difference threshold (ΔI), the minimal detectable change in intensity of a stimulus, is proportional to the magnitude of the stimulus (I).

$$\frac{\Delta I}{I} = K$$

Lorraine's psychophysical research has been influential in at least three areas: time perception, contingent color aftereffects (the McCollough effect), and the judgment of contingent relationships.

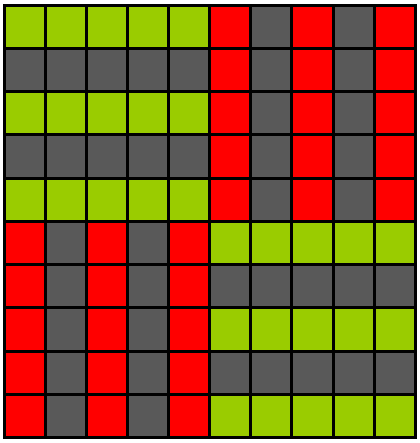
### *Time Perception*

Until the 1980s, animal and human time perception research was conducted independently. Each type of timing research had its own laboratories, techniques, traditions, and models. Time perception research changed dramatically when John Gibbon and Lorraine organized a meeting of both human and animal timing researchers at New York Academy of Sciences in 1983.[1] Primarily as a result of insights resulting from that meeting, there no longer are separable *human* timing and *animal* timing disciplines. One development that led to this integration was evaluation of whether Scalar Timing theory (developed by Gibbon and colleagues from research with rats) was relevant to understanding human timing.[2] For both species, bisection of temporal intervals ($T_{½}$) is equal to the geometric mean of the judged intervals (GM) divided by the square root of a bias parameter (β):

$$T_{1/2} = \frac{GM}{\sqrt{\beta}}$$

### *Contingent Color Aftereffects*

Lorraine completed many studies of the orientation-contingent (and similar) color aftereffects (the McCollough effect). Some of these studies have been summarized.[3] The color feature in the Garden simulates the aftereffect seen after McCollough effect induction with red horizontal grids and green vertical grids:



[1] Gibbon & Allan (Eds). (1984). *Timing and time perception*. Annals of the New York Academy of Sciences.

[2] Allan & Gibbon (1991). Human bisection at the geometric mean. *Learning & Motivation, 22*, 39-58.

[3] Siegel & Allan (1992). Pairings in learning and perception: Pavlovian conditioning and contingent aftereffects. In Medin (Ed.), *The psychology of learning and motivation*, Vol. 28 (pp. 127-160). San Diego CA: Academic Press.

Findings by Lorraine and her students and colleagues demonstrated that the McCollough effect (as well as other perceptual phenomena) could best be understood as instances of Pavlovian conditioning. Unique predictions of a Pavlovian conditioning analysis were derived from the Rescorla-Wagner model of learning.[4] The three equations of the Rescorla-Wagner model may be seen in the garden:

$$\Delta V_A = \alpha_A \beta (\lambda - V_{AX})$$

$$\Delta V_X = \alpha_X \beta (\lambda - V_{AX})$$

$$V_{AX} = V_A + V_X$$

***Judgment of Contingent Relationships***

Lorraine completed a considerable amount of research concerning contingency judgment. Most of this research used a discrete trial format with a single cue (e.g., information that a patient has, or has not, taken a drug) and a single outcome (e.g., information that a disease symptom has, or has not, been alleviated): On each trial the cue either is presented (C) or is not presented (~ C), and then the outcome either does occur (O) or does not occur (~ O). The two-by-two matrix representing this procedure is depicted in the Garden -- the letters in the cells (*a, b, c, d*) represent the frequency of occurrence of the four cue-outcome combinations:

| | O | ~O |
|---|---|---|
| C | *a* | *b* |
| ~C | *c* | *d* |

Lorraine noted that there are various ways of summarizing the relationship between the cue and outcome, however one particularly useful measure is ΔP – the difference between the conditional probability of the outcome given the cue, and the outcome given no cue.[5] The formula for ΔP is engraved in the garden:

$$\Delta P = P(O|C) - P(O|\sim C)$$

[4] Siegel & Allan (1996). The widespread influence of the Rescorla-Wagner model. *Psychonomic Bulletin and Review*, *3*, 314-321

[5] Allan (1980) A note on measurement of contingency between two binary variables in judgment tasks. *Bulletin of the Psychonomic Society*, *15*, 147-149.

Much of Lorraine's early contingency judgment research was based on learning models (especially the Rescorla-Wagner model).[6] Later research led her and her colleagues to conclude that understanding of such judgments required an appreciation not only of learning theory, but also signal detection theory.[7] That is, when faced with a contingency judgment task, the participant asks himself or herself two questions before offering an estimate of the cue-outcome relationship: "What do I perceive to be the magnitude of the relationship?" and, given that perception, "how should I respond?" Thus, the judgment of whether or not there is a contingency between a cue and outcome depends upon both (a) an individual's *sensitivity* to the contingent relationship (e.g., the statistical relationship between a symptom and a disease), and (b) other variables that affect the individual's *criterion* -- that bias the individual towards judging a particular contingency as either stronger or weaker than the actual ΔP value (e.g., is the drug innocuous or does it have severe side effects?) The garden is engraved with formulas relevant to this more complete analysis of contingency judgment.[8] The perceived strength of the cue-outcome relationship is best explained by the Bush Mosteller rule (a precursor to the Rescorla-Wagner model):

$$\Delta V = \alpha\,\beta\,(\lambda - V)$$

In the version of signal detection theory used in this research, sensitivity (d') can be computed by subtracting the Z-score of "false alarms" (incorrect prediction that an outcome will occur, given that the cue was presented) from the Z-score of hits (correct prediction that an outcome will occur, given that a cue was presented:

$$d' = Z_H - Z_{FA}$$

To compute response criterion (C):

$$C = -\frac{[Z_H + Z_{FA}]}{2}$$

[6] Allan (1993) Human contingency judgments: Rule based or associative? *Psychological Bulletin, 114*, 435-448.

[7] Allan, Siegel, & Tangen (2005) A signal detection analysis of contingency data. *Learning & Behavior, 33*, 250-263.

[8] Siegel, Allan, Hannah, & Crump (2009) Applying signal detection theory to contingency assessment. *Comparative Cognition and Behavior Reviews*, 4, 116-143.

## Contributions to McMaster University

Lorraine served on just about every important committee at McMaster, and chaired many of them.[9] In the Garden her service to the University is commemorated by a reference to one of her major achievements. For many years, Lorraine was the Chair of the Joint Senate/Faculty Association Drafting Committee that prepared various revisions of the *McMaster University Policy and Regulations with Respect to Academic Appointment, Tenure and Promotion*. Because this policy was traditionally printed on yellow paper, it has generally been termed the "Yellow Document:"

## Family and Friends

Lorraine's mother (Goldie) and father (Louis) emigrated from Poland in the 1920s, and married in Canada. Lorraine's parents, as well as her brother (Harold), daughter (Robyn), son (Kevin), and grandson (Ryan) are commemorated in the Garden.

[9] http://www.science.mcmaster.ca/pnb/people/172-people/in-memoriam/346-lorraine-allan.html

**Goldie**

**Louis**

**Harold**

**Kevin**

**Robyn**

**Ryan**

When Lorraine was growing up, the language spoken at home was Yiddish – Lorraine's first language. The Garden incorporates a Yiddish proverb:[10]

מענטש טראַכט און גאָט לאַכט.

Lorraine's parents were active in secular Jewish organizations, socialist causes, and union organization. They spent their free time with other like-minded people at a secular Jewish summer community:[11]

**Camp**
**Naivelt**

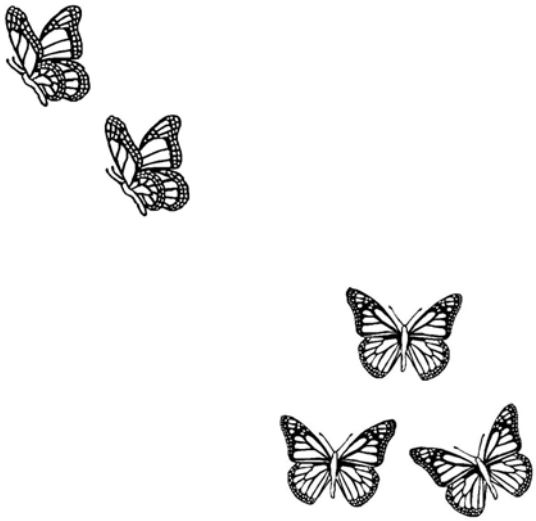
Lorraine's father, like many Jewish immigrants of the era, was a skilled garment worker. In the 1950s, Lorraine's parents opened a women's clothing store in Toronto. The store was named after Lorraine, but one "r" was omitted (perhaps to save money in the construction of the neon sign). The family lived above the store, and Lorraine had fond memories of her life in downtown Toronto, and her high school years at the nearby Bloor Collegiate Institute.

**Loraine Ladies' Ready-to-Wear**
**1104 Bloor Street West**

Lorraine had many close friends, at McMaster and in the wider scientific community. The five butterflies in the Garden commemorate Lorraine's friendships. About 10 years ago, Lorraine's colleague, Margo Wilson, became ill. Lorraine and three other faculty and staff in the Psychology Department (Betty Ann Levy, Erie Long, and Marg Wilby) came together to support Margo when she needed assistance, to celebrate with her when she was in remission, and to generally enjoy each others' company, food,

[10] *Mentsch trakht un Got lakht*. We plan and God laughs.
[11] http://en.wikipedia.org/wiki/Camp_Naivelt; http://www.winchevskycentre.org/institutions/naivelt.html

and wine. The group, for obscure reasons, came to be called the butterflies. Margo died on September 24, 2009.[12] Lorraine died on December 16, 2012.



The Lorraine G. Allan Memorial Garden was dedicated on September 20, 2013.

[12] http://www.science.mcmaster.ca/pnb/people/60-people/faculty/197-dr-margo-wilson.html