# Communication & Learning?

- Communication vs Mimetic Technology
- Communication technology is not unalloyed good
  - power
  - fascination and pleasure
  - deception

Communication

$\neq$ $\neq$

Information $\neq$ Knowledge

- Reflection vs Discourse …

# Learning as Research Activity

- **Learning by doing: Make your own**
  - tools, to encapsulate knowledge (theorems)
    - Cabrera Physics
    - Tversky Psychology
  - models, to learn how to abstract, analyze
  - views, to learn how to communicate
- **Research Environment = Learning Environment**
  - research -- understand something known to few
  - study -- understand something known to many
  - experts and novices share "language," -- different registers, dexterity

# Scholarly Gestures

- **Create and interpret models**
  - algebraic, geometric
  - relational
  - numerical, statistical
  - logical
- **Create and interpret narratives**
  - text
  - cinema
  - music
- **Annotate anything with anything**
- **Create and use functions**

# What's Fundamental? What's Artifact?

- Network is artifact.  Latency becomes
  - object inertia
  - metric on places
- Multimedia is an artifact.
- Expressivity is fundamental.

# Trends: "Computing Technology"


Monolithic, OS-bound apps ->

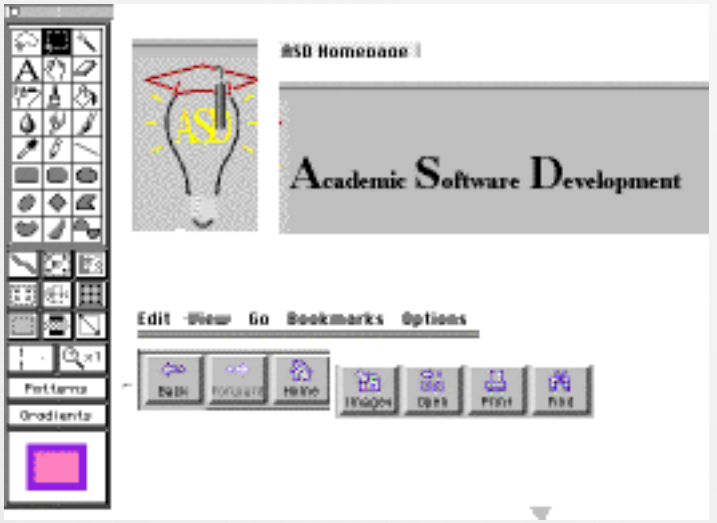
-> distributed tools

-> pure document

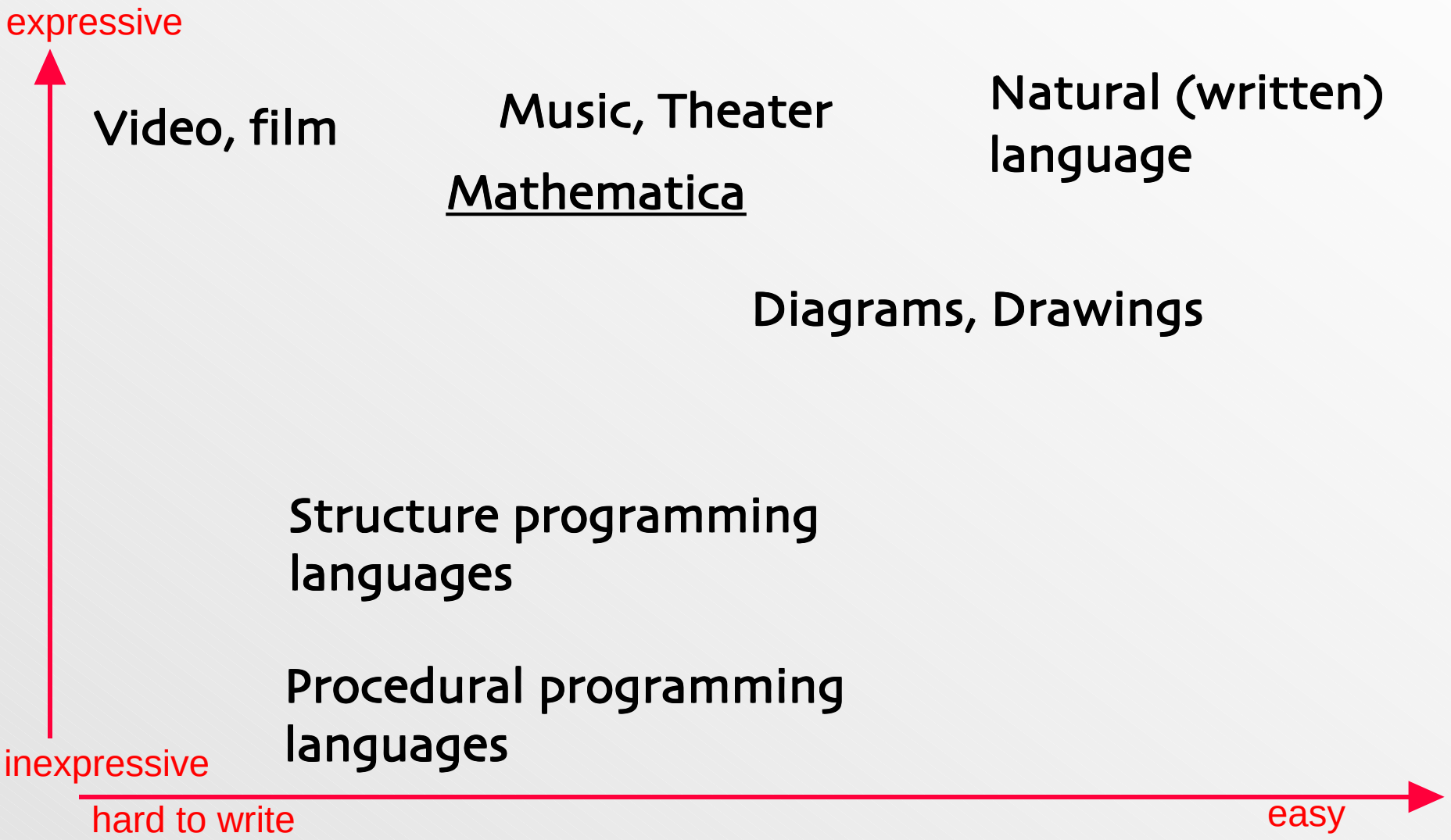
Transmit data ->

-> remote process

-> transmit objects



# Trends: "Writing Technologies"



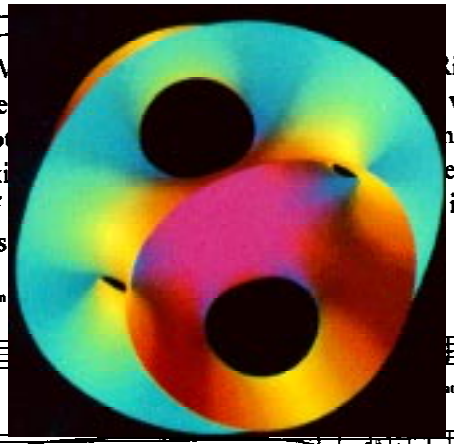
# Old Dualities

- Natural language narratives, analog art

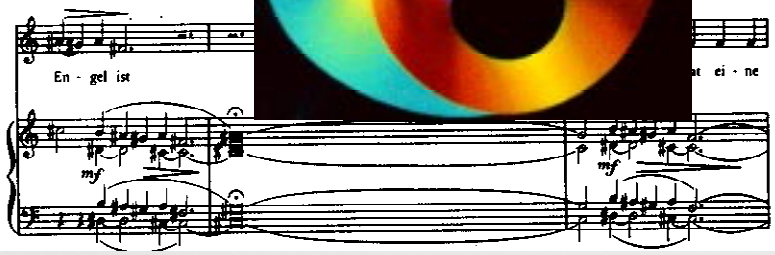
**17.2.11.** Now define the continuous map $f_4: M \to \mathbb{R}^n$ in the following way

$$f_4(x) = \begin{cases} f_3(x) & \text{for } x \in M_i - M_i^0, \\ (1-t)f_3(x) + tpf_3(x) & \text{for } x = (b,t) \in B_i^0 \times [0,1] = T_i, \\ \tilde{f}_i(x) & \text{for } x \in M_i^0 - T_i, \end{cases}$$

here $p$ is the projection on $\Gamma_i$, while $\tilde{f}_i: (M_i^0 - T_i) \to \Gamma_i$ is the smooth $C_{n-1}$-operimetric map spanning $\tilde{g}_i: B_i' \to \Gamma_i$, $\tilde{g}_i = pf_3$, which exists according to the induction hypothesis.



In the third poem ("M ilke consigns to a sublime parenthe we knew how pure she was! Did no er in the wood, so lose itself in looki e unicorn begot itself, the creature of in the respective versions, responds

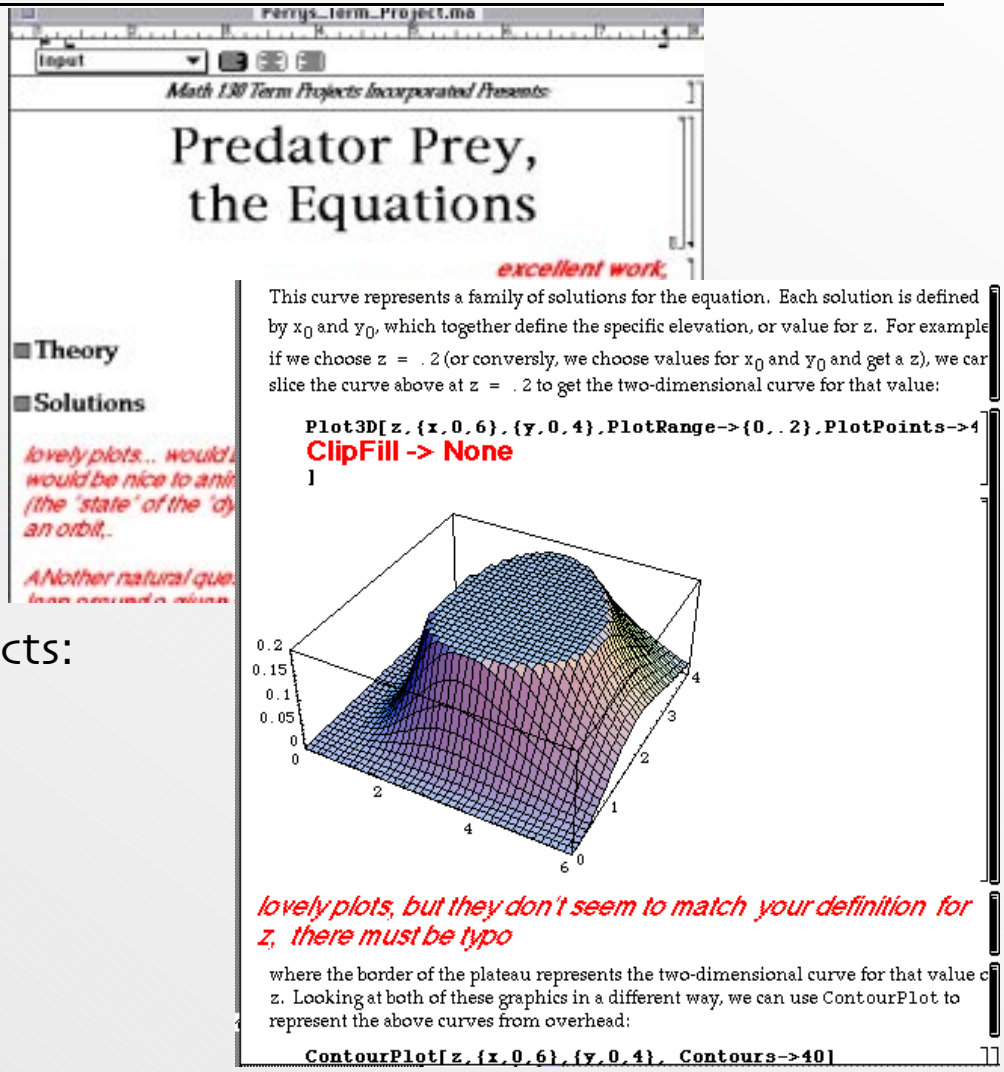



```
int main(int argc, char* argv[])
{
#ifdef DEBUG
    syslog(LOG_WARNING, "mmddSession: created
mmddResMgr and sessionMgr\n");
    fprintf(stderr, "mmddSession: created
mmddResMgr and sessionMgr\n");
        fflush(stderr);
#endif

#ifdef DEBUGREAL
        {
                char *p;
                char **argPtr;
                register int i;
                FILE *fd;

                argPtr = argv;
                i = 0;
                while (i < argc)
                {
```


Programming language, application

# Performable Writing

* Readable by human
* Interpretable by computer




## Example

Differential Equations - student projects:

Written narrative

Interpretable (math) funtions

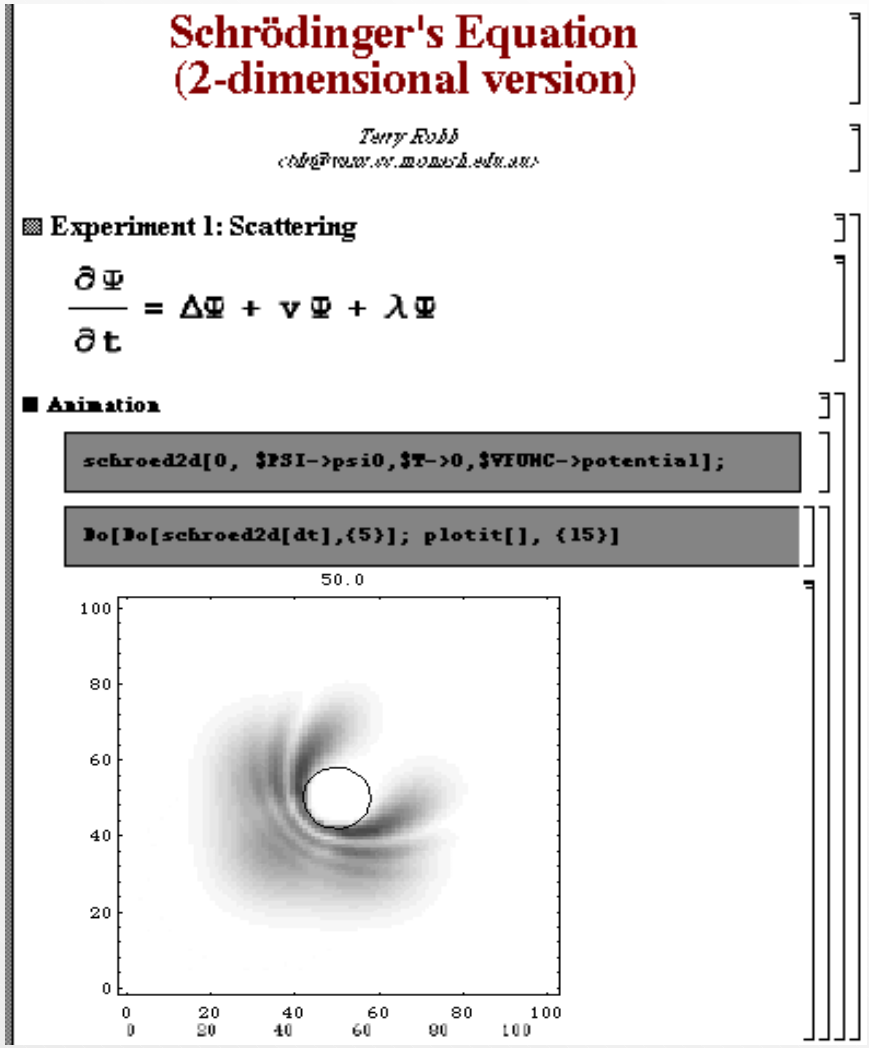
Structures amplify coversation

between teacher and student

# Performable Writing

**Example:** Quantum Mechanics Simulations

- Combine symbolic with numeric functions
- Combine mathematics with English narrative
- Produce video in place



# Problems

- **Modalities**
  - Sound, Music and Speech
  - Haptic
  - Embed computational artifacts into physical media
- **Representations**
  - Structured media: text, databases, scorefiles, Mathematica
  - Opaque media: human, realia, bitmap, digital video, aiff sound
- **New writing technologies (languages) for**
  - Action and interaction
  - Multi-modality
  - Performable literature