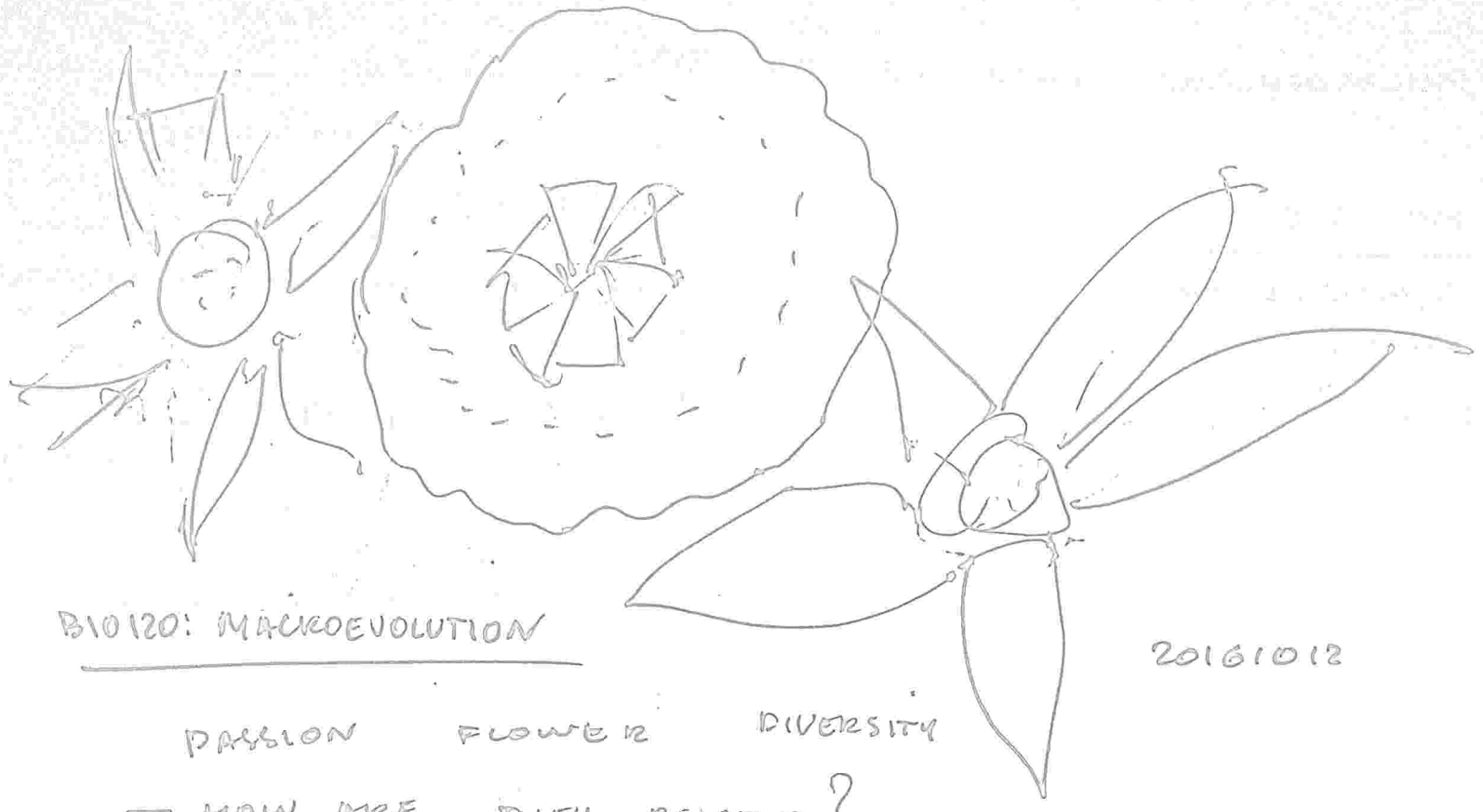


BIO120: MACROEVOLUTION

20161012

PASSION FLOWER DIVERSITY

— HOW ARE THEY RELATED?

CAROLUS LINNAEUS

- FATHER OF TAXONOMY
  - → NAMING IS IMPORTANT

TAXON	TAXONOMY
KINGDOMS	THE STUDY OF CLASSIFICATION
→ PHYLA	SYSTEMATICS
→ ...	THE STUDY OF BIODIVERSITY AND THE EVOLUTIONARY RELATIONS

PHENETICS

CLASSIFICATION
BASED ON
OVERALL RESEMBLANCE

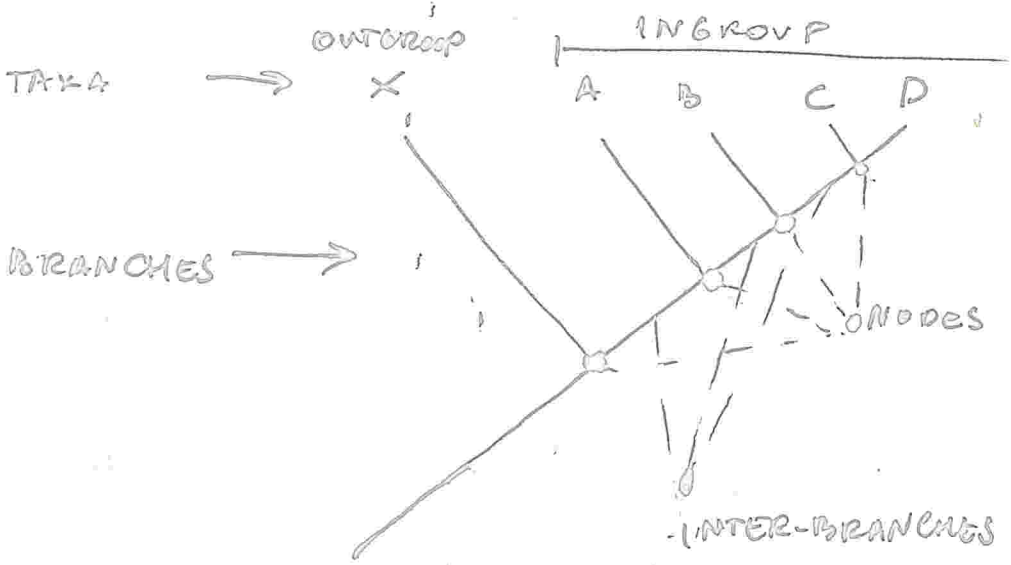
CLADISTICS

CLASSIFICATION
BASED ON THE
PHYLOGENETIC RELATIONSHIPS

"SUBVERSIVE APPROACH"
WILLIE HENNIG
→ TREES AS AN INSTRUMENT

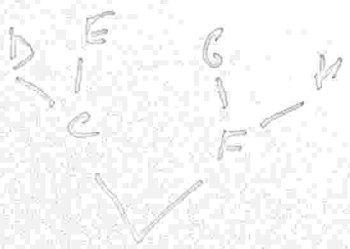
SWEPT FROM
THE SMITHSONIAN
AFTER THE REDISCOVERY
OF HENNIG'S BOOK.

A PHYLOGENETIC TREE

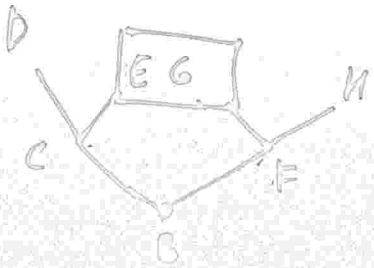


MONOPHYLETIC GROUP

ONE ANCESTOR GAVE RISE TO ALL SPECIES IN THAT TAXON AND NO SPECIES IN THE INGROUP.



MONOPHYLETIC



NON-MONOPHYLETIC

CRITICAL STEPS OF CONSTRUCTING TREES

- IDENTIFICATION OF ANCESTRAL AND DERIVED TREES

HOMOLOGY

SIMILARITY OF TRAITS IS DUE TO SHARED ANCESTRY

HOMOPLASY

SIMILARITY AS A RESULT OF CONVERGENT EVOLUTION

CONVERGENT EVOLUTION

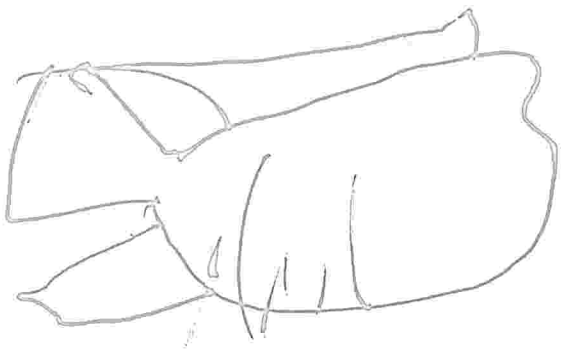
SHARED BIOLOGY NOT SHARED ANCESTRY

CACTUS FAMILY

MILKWEED FAMILY

AFRICA - NOT CACTI!

CONVERGENT EVOLUTION IN CICHLID FISHES OF THE AFRICAN GREAT LAKES



- ALL LIFE IS RELATED THROUGH BRANCHING DESCENT
- COMMON GENETIC CODE IS EVIDENCE THAT ALL LIFE IS RELATED
- EVOLUTIONARY RELATIONSHIPS ARE REFLECTED THROUGH DNA.

TOLWEB.ORG / TREE

WAYNE MADDISON | DAVE MADDISON

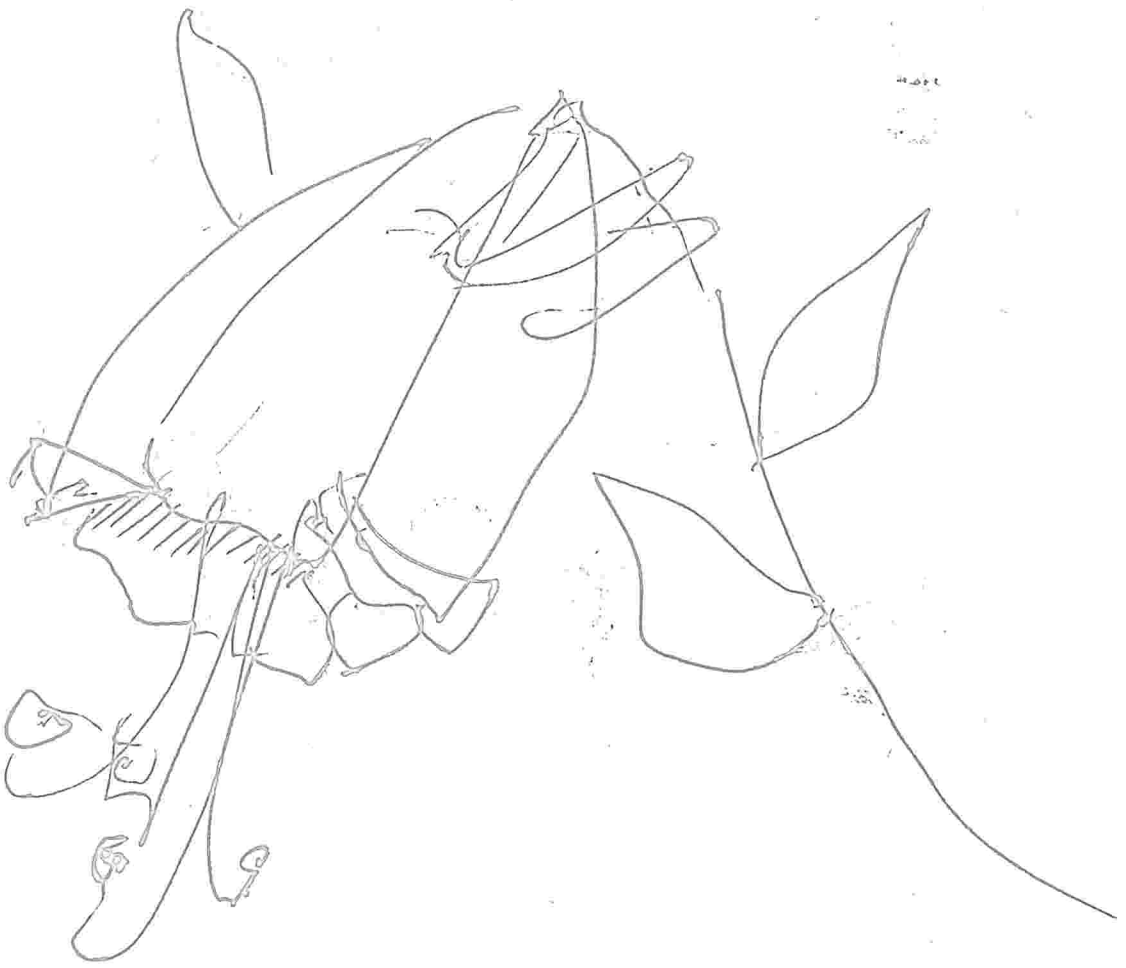
DNA SEQUENCING IS ENABLING RAPID CONSTRUCTION OF THE TREE OF LIFE

10 000 WEBPAGES ABOUT BIODIVERSITY AND PHYLOGENETIC RELATIONSHIPS

KEY INNOVATIONS

- ORIGIN OF A NOVEL TRAIT RESULTING IN ADAPTIVE RADIATION

→ EXPLORATION OF EXISTING RESOURCES



DIVERSE FLOWERS ASSOCIATED WITH DIFFERENT POLLINATORS IN COLUMBINE SPURS.

* PHYLOGENY SHOWS RAPID BURST OF SPECIATION WITH ACQUISITION OF NECTAR SPUR — SHORT BRANCH LENGTHS IN COMPARISON WITH SISTER GROUP

GENE SEQUENCING . INTRODUCES STRUCTURE TO THE PHYLOGENIES

- 16 FOLD VARIATION IN N. SPUR LENGTH
- 7 INDEPENDENT POLLINATOR SHIFTS

⟶ CLEAR DIRECTIONALITY IN SPUR LENGTH EVOLUTION ✓

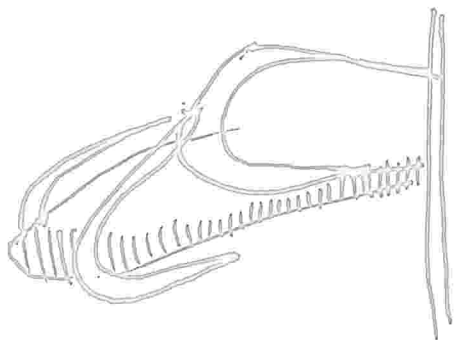
SEXUAL CONFLICT AND THE ARMS RACE IN WATER STRIDERS

- LOCKE
- THE OPTIMAL MATING RATE IS LOWER FOR FEMALES THAN MALES.

⇒ FEMALES TEND TO RESIST MATING ATTEMPTS.

⇒ BEHAVIOURS EVOLVE TO AID RESISTANCE IN FEMALES

⇒ GRASPING STRUCTURES EVOLVE IN MALES



ANTAGONISTIC EVOLUTION ESCALATES THE ARMS RACE.

GRIPS IN MALES ARE MORE PROMINENT