

KEIO University, Tokyo

Hajime Yoshino's
**Logical
Jurisprudence**

*Visualisation
by Friedrich Lachmayer*

3rd July 2007

based on:

The Structure of Legal System - in Terms of Logical Jurisprudence

2007/02/22

IRIS 2007, Salzburg, Austria

by Hajime Yoshino

Meiji Gakuin University

based on:

Logical Structure of Change of Legal Relation and its Representation in Legal Knowledge Base System

*June 4 – 8, 2007, Stanford, California
11th International Conference on
Artificial Intelligence and Law
by Hajime Yoshino
Meiji Gakuin University*

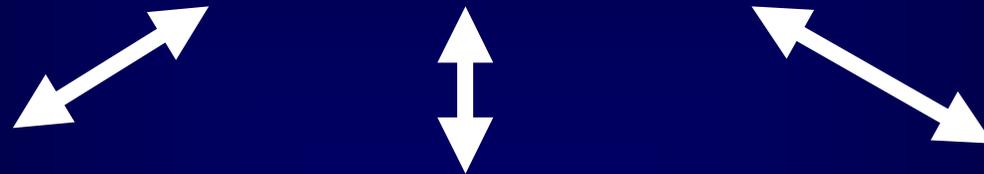
Textuality → *Visualisation*

1D → *2D*

Textuality → Visualisation → Virtualisation

1D → 2D → 3D/nD

Logical Formalisation



Textuality → *Visualisation* → *Virtualisation*

1D → *2D* → *3D/nD*

Introduction to the Visualisation-Pattern

Introduction to the Visualisation-Pattern

Every Day Life Situations

Introduction to the Visualisation-Pattern

**Stage
of Rights and Duties**

Every Day Life Situations

Introduction to the Visualisation-Pattern

**State
Law**

**Stage
of Rights and Duties**

Introduction to the Visualisation-Schemata

State, Law

**Legal Science
Jurisprudence**

Stage of Rights and Duties

**Scientific Audience
Applications**

Metalevel

State, Law

Jurisprudence

Stage of Rights and Duties

Scientific Audience

Metalevel

Pufendorf

Natural Law Principles

State, Law

Deduction

Law

Jurisprudence

Stage of Rights and Duties

Scientific Audience

Metalevel

Traditional Legal Concepts

Customary Law

State,

International Law

Constitution

Legal Hierarchy

indiv. Judgements

Jurisprudence

Private Treaties

Stage of

Legal Awareness

Scientific Audience

Traditional Juridical Concepts

State, Law

Legal Philosophy

Legal Dogmatics

Legal Sociology

Stage of Rights and Duties

Scientific Audience

Metalevel

Kelsen

Basic Norm

State, Law

Constitution

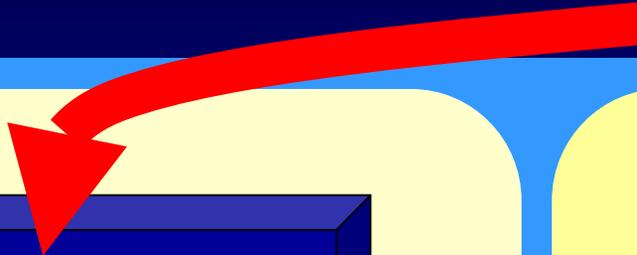
Legal Hierarchy

indiv. Judgements

Jurisprudence

Stage of Rights and Duties

Scientific Audience



Metalevel

Logic

Yoshino

State, Law

Logical Jurisprudence

**Scientific
Logical Sentences**

Stage of Rights and Duties

Scientific Audience

Metalevel

Logic

Kelsen

Yoshino

State, Law

1. **Scientific Evolution**

Logical Jurisprudence

Scientific
Logical Sentences

Stage of Rights and Duties

Scientific Audience

Metalevel

Logic

Yoshino

State, Law

L - Logical Jurisprudence

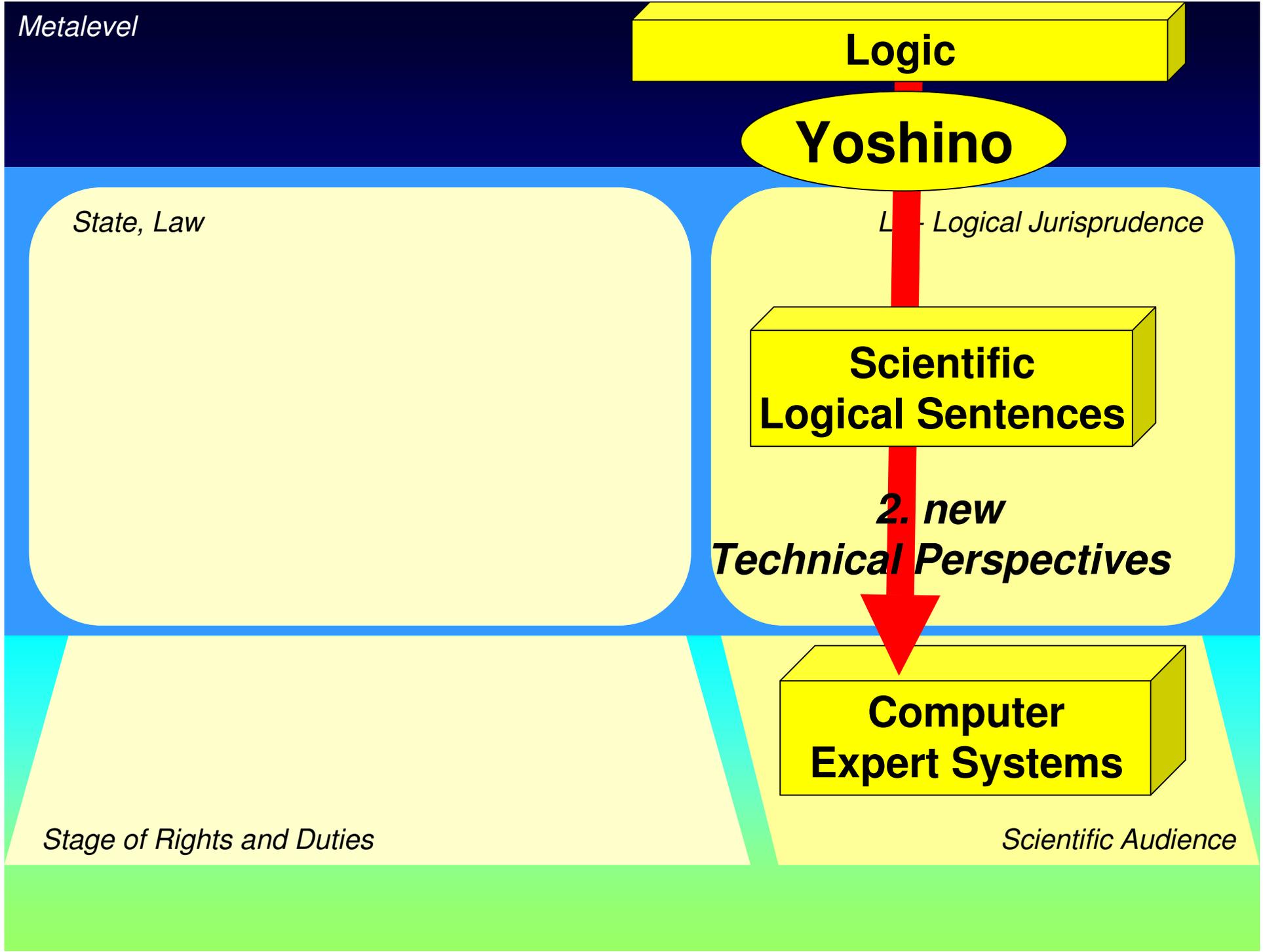
**Scientific
Logical Sentences**

**2. new
Technical Perspectives**

**Computer
Expert Systems**

Stage of Rights and Duties

Scientific Audience



Metalevel

Introduction

Logic

Yoshino

State, Law

L - Logical Jurisprudence

Scientific
Logical Sentences

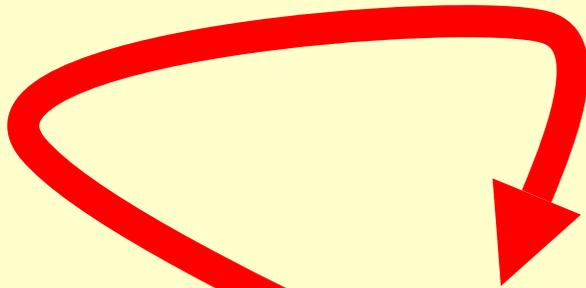
Applications

Computer
Expert Systems

Applications

Stage of Rights and Duties

Scientific Audience



LJ

**Logical
Jurisprudence**

Metalevel

State, Law

**whole
Legal System**

LJ - Logical Jurisprudence

**Logical
Jurisprudence**

try to analyze and explain



Stage of Rights and Duties

Scientific Audience

LJ

Three Primitives

LJ

LJ try to analyze and explain

the whole legal system

using minimum elements

State, Law

LJ - Logical Jurisprudence

three Primitives:

IR Inference Rule
Modus Ponens

V Validity

S Sentence

Stage of Rights and Duties

Scientific Audience

LJ

LJ starts from three primitives:

(1) “sentence”

*LJ consider that norm as a meaning does not exist.
LJ starts from sentences.*

(2) “validity” of sentence

*legal validity as legal truth
“is_valid(sentence1, goal1,time1)”*

(3) “inference rule”

Modus Ponens: $\boxed{A} \implies \boxed{B}$

LJ

Legal Sentences

State, Law



LJ - Logical Jurisprudence



*LJ starts not from Legal Norms
but from Legal Sentences.*

Stage of Rights and Duties

Scientific Audience

LJ

**Three Types
of
Legal Sentences**

LRS

Legal Rule Sentence

describes

Legal Rules

Metalevel

State, Law



LJ - Logical Jurisprudence



Stage of Rights and Duties

Scientific Audience

LFS

Legal Fact Sentence

describes

Legal Facts

Metalevel

State, Law

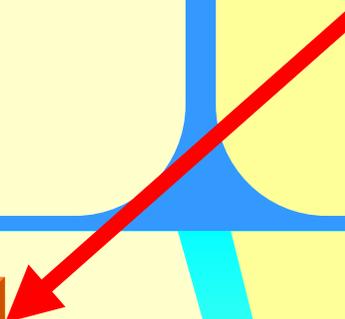
LJ - Logical Jurisprudence

LFS
Legal Fact Sentence

LF Legal Fact

Stage of Rights and Duties

Scientific Audience



LOS

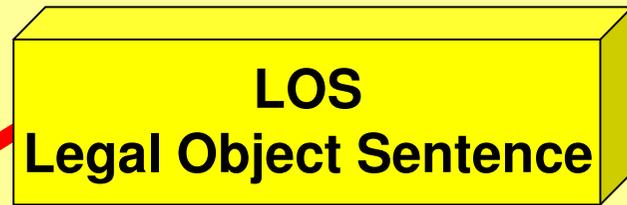
Legal Object Sentence

**describes Legal Objects,
especially Obligations**

Metalevel

State, Law

LJ - Logical Jurisprudence



Stage of Rights and Duties

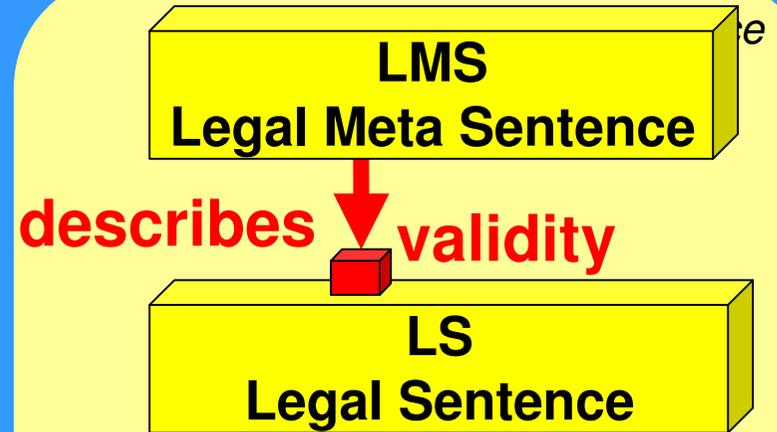
Scientific Audience

LMS

Legal Meta Sentence

**describes about the
validity of legal sentences**

State, Law



Stage of Rights and Duties

Scientific Audience

ELS

Elementary Legal Sentence

is the smallest unit of legal sentences.

“One must drive a car under 100 km /hour on a highway”

Metalevel

State, Law

LJ - Logical Jurisprudence

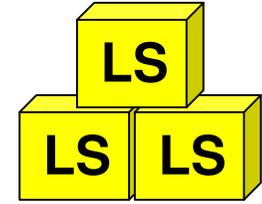
ELS

*smallest unit
of Legal Sentences*

Stage of Rights and Duties

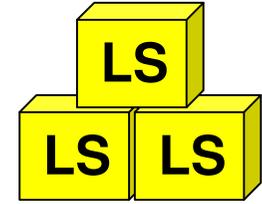
Scientific Audience

Structure of Connection of Legal Sentences



- (1) “And” Structure of the Connection*
- (2) Connection in Complex Sentence*
- (3) Connection of LOS with LMS*
- (4) Connection of LMS with LMS*

Structure of Connection of LS: (1)



**“And” structure
of the connection
of LS**

State, Law

LJ - Logical Jurisprudence



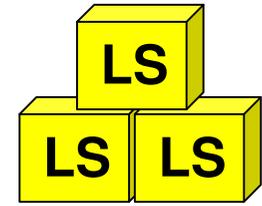
a group of LS

which has an unique name

Stage of Rights and Duties

Scientific Audience

Structure of Connection of LS: (2)



Connection in Complex Sentence

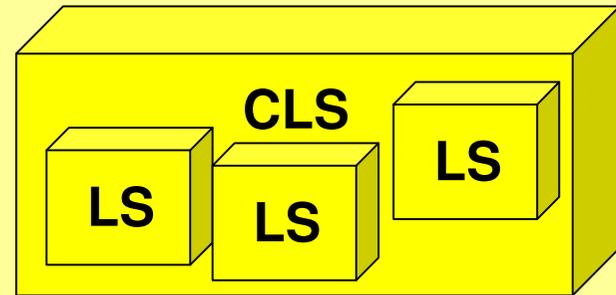
CLS

Complex Legal Sentence

includes Legal Sentences

State, Law

LJ - Logical Jurisprudence



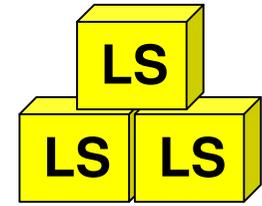
a group of LS

which has an unique name

Stage of Rights and Duties

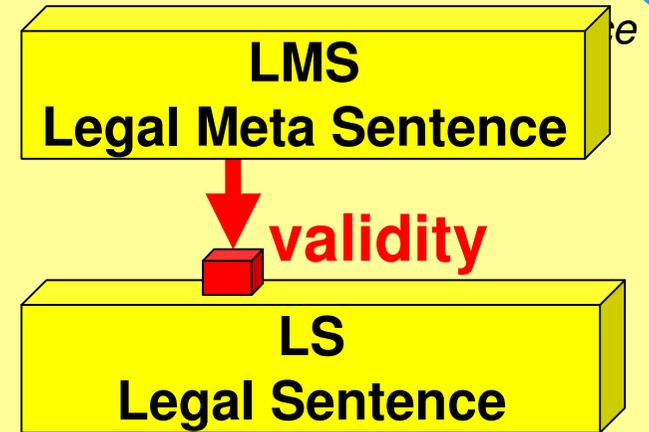
Scientific Audience

Structure of Connection of LS: (3)



Connection of LOS with LMS

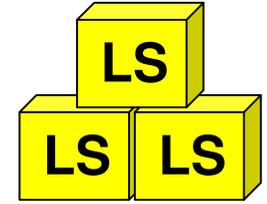
State, Law



Stage of Rights and Duties

Scientific Audience

LJ



Legal Inference

Metalevel

State, Law



LJ - Logical Jurisprudence



Stage of Rights and Duties

Scientific Audience

Metalevel

State, Law

Legal Rules

LJ - Logical Jurisprudence

LRS

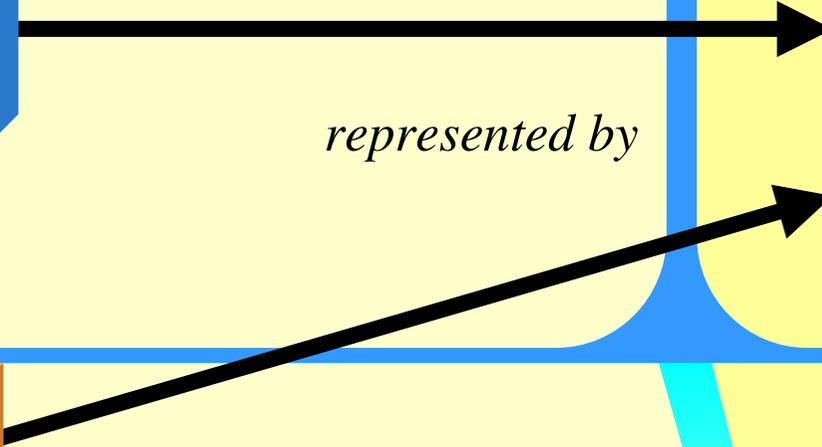
LFS

represented by

Legal Facts

Stage of Rights and Duties

Scientific Audience



State, Law

Legal Rules

represented by

IR Inference Rule
Modus Ponens

LRS

LFS

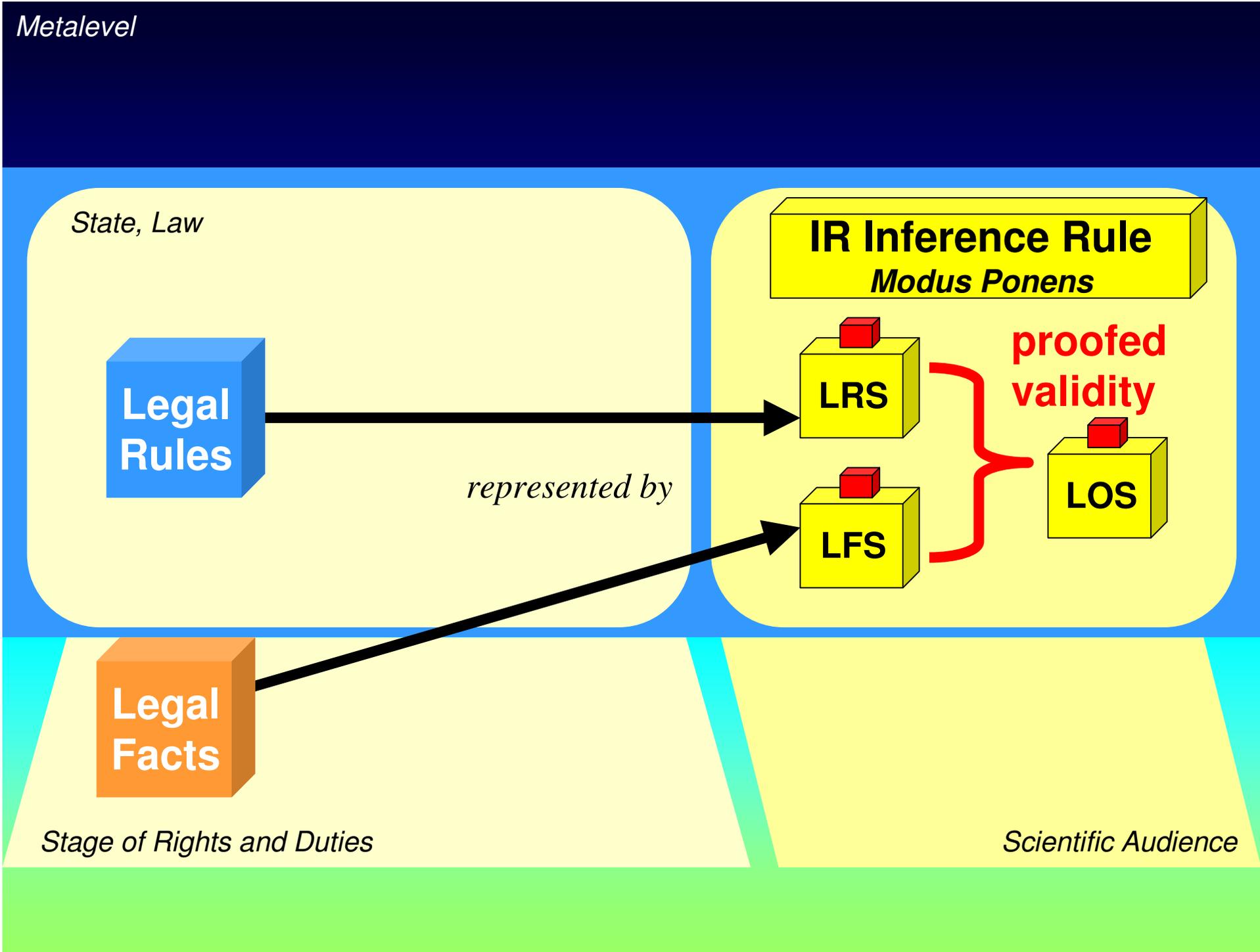
proved validity

LOS

Legal Facts

Stage of Rights and Duties

Scientific Audience



Metalevel

State, Law

Legal Rules

represented by

IR Inference Rule
Modus Ponens

LRS

LFS

proved validity

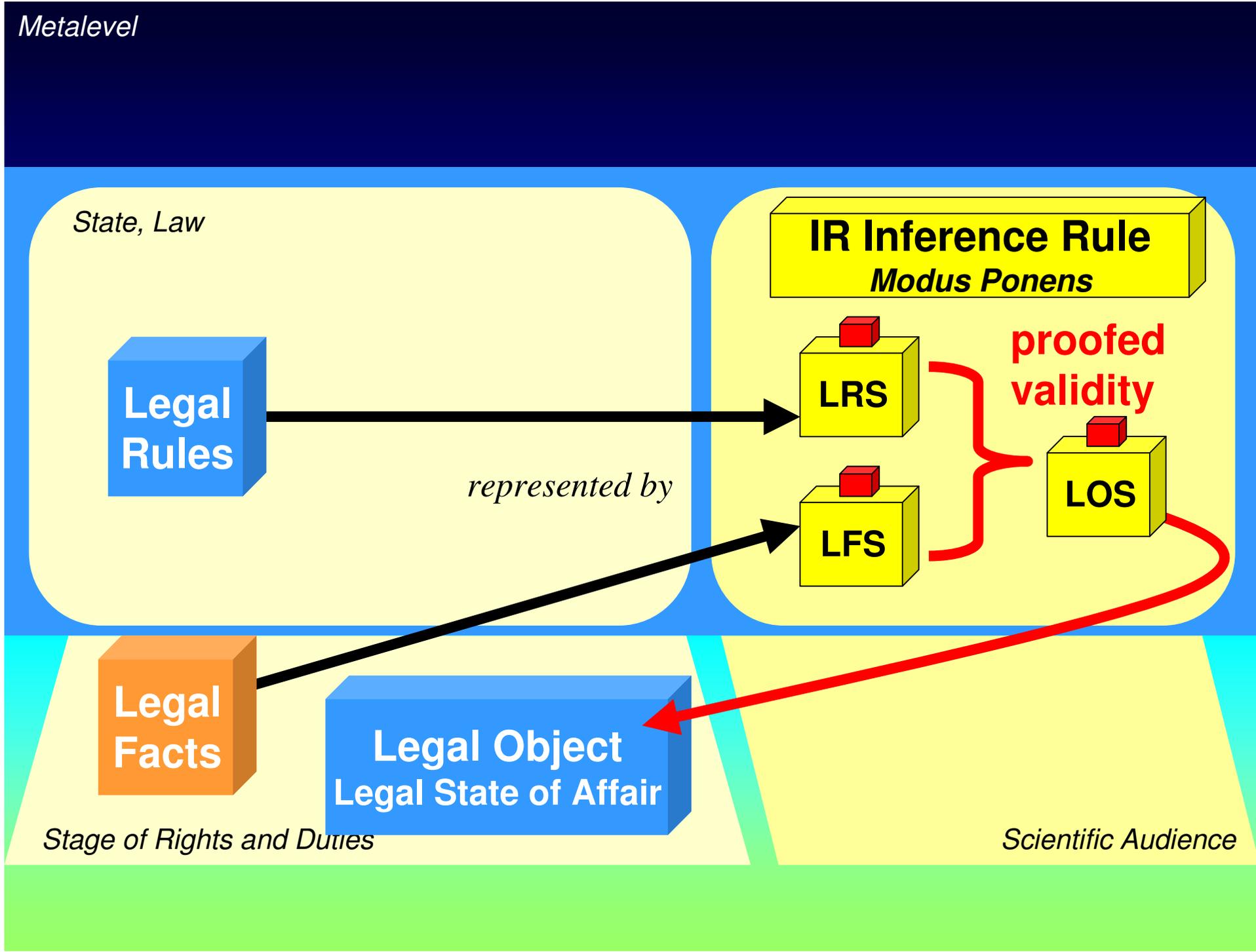
LOS

Legal Facts

Legal Object
Legal State of Affair

Stage of Rights and Duties

Scientific Audience



Metalevel

Logic

State, Law

Legal Rules

represented by

IR Inference Rule
Modus Ponens

LRS

LFS

proved
validity

LOS

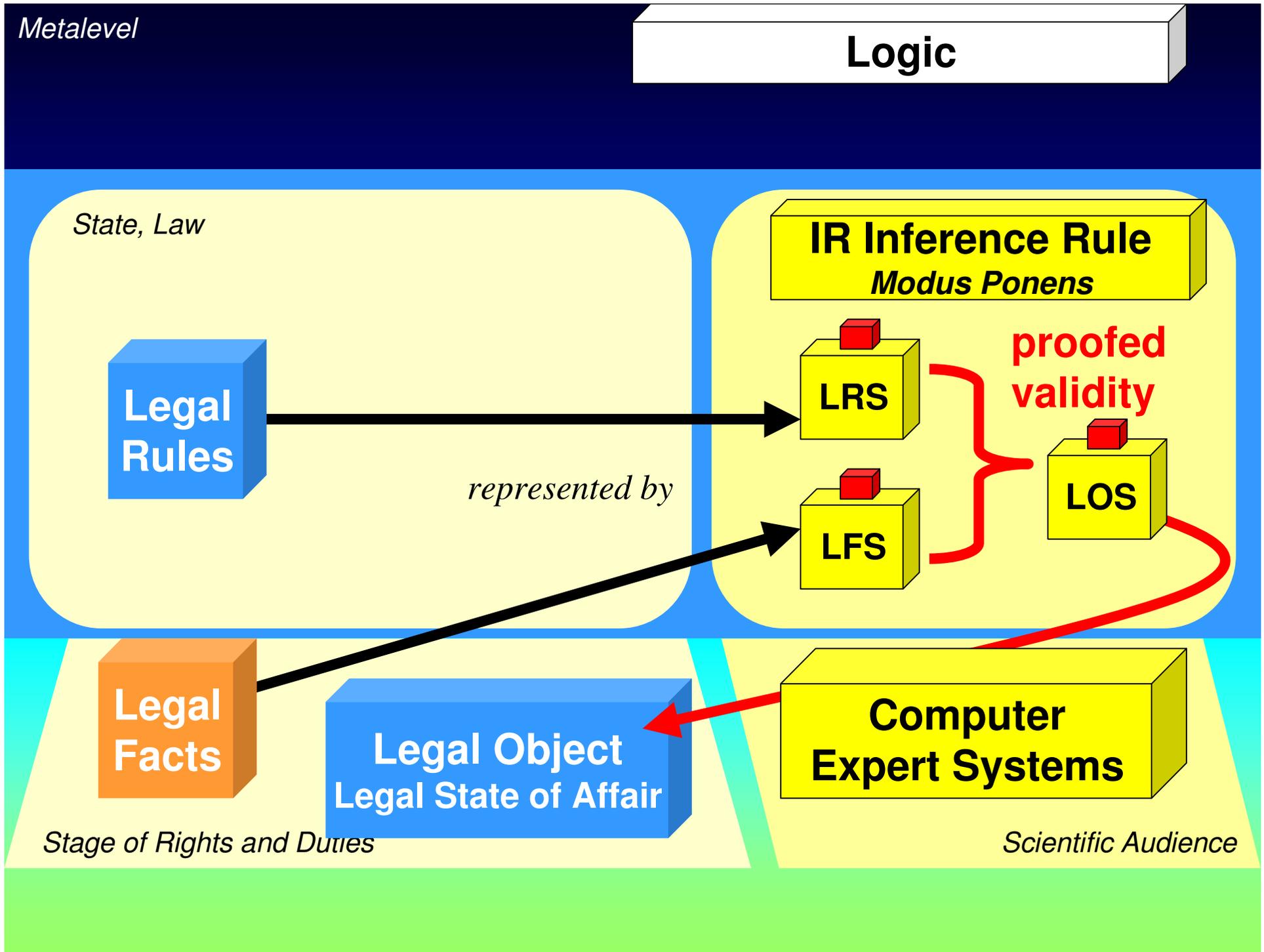
Legal Facts

Legal Object
Legal State of Affair

Computer
Expert Systems

Stage of Rights and Duties

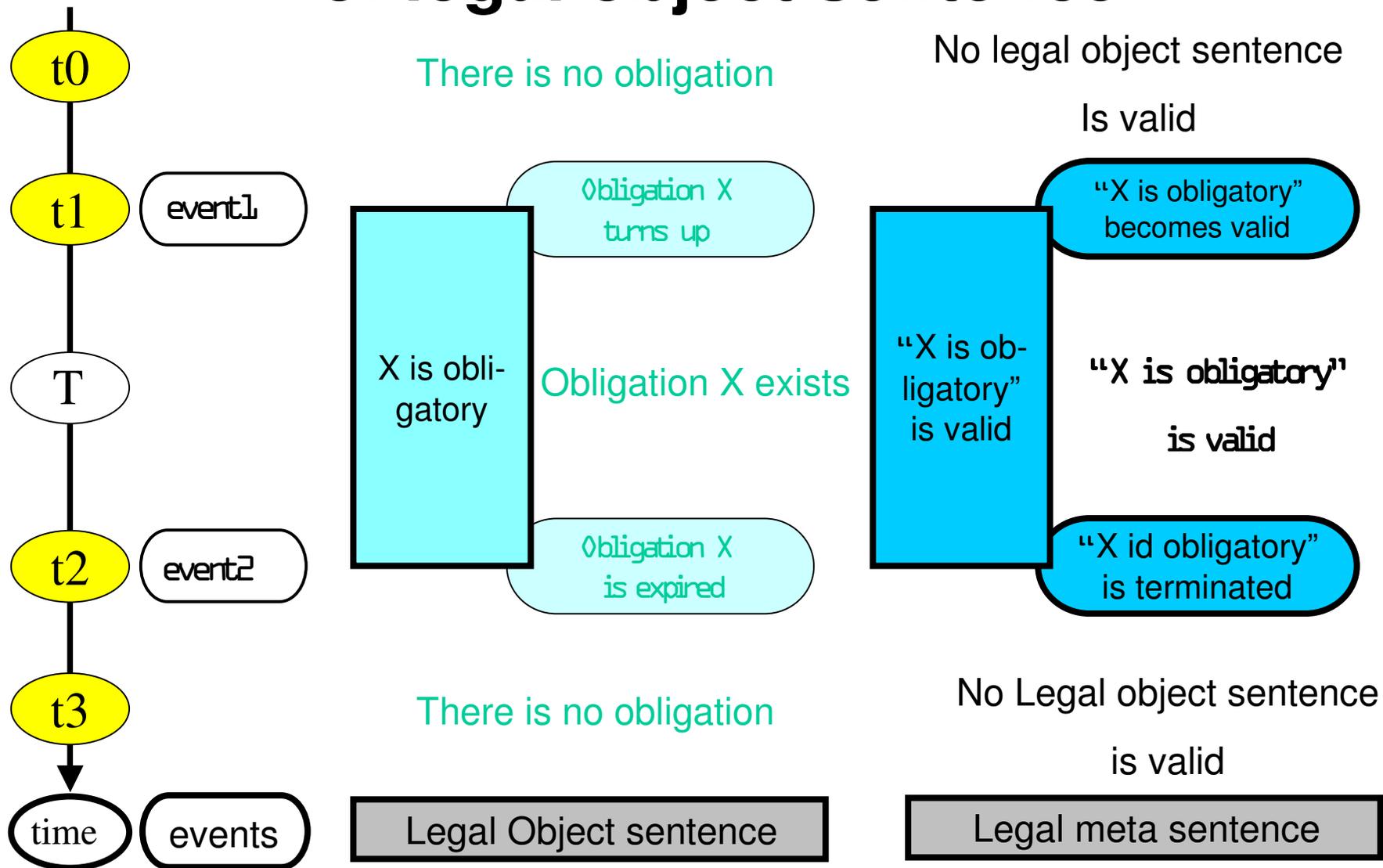
Scientific Audience



LJ

Time-Structure of Legal Objects

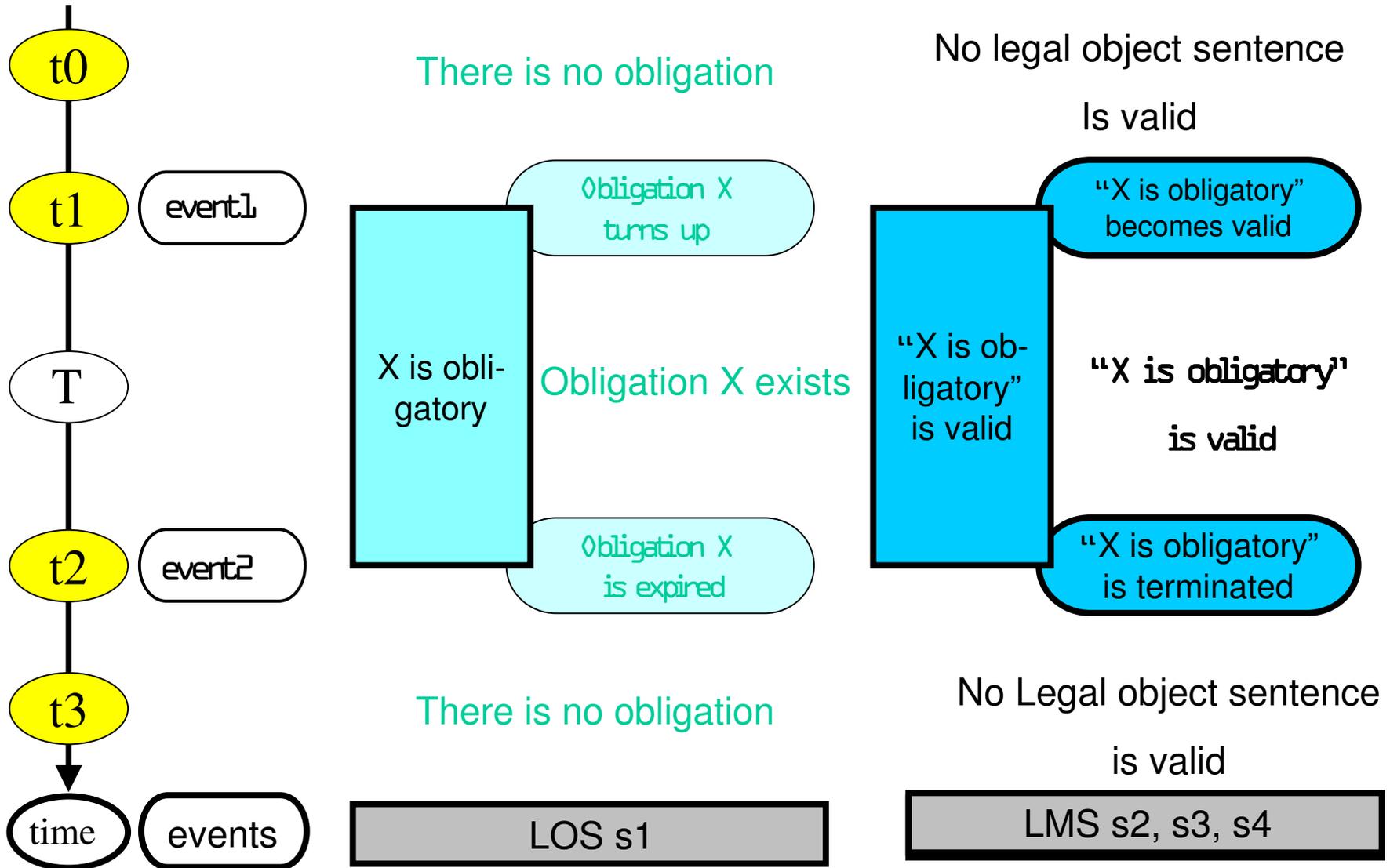
The existence of obligation and the validity of legal object sentence



Formalization of connection of LOS with LMS

- For example: “‘It is obligatory for Anzai that Anzai deliver the goods to Bernard’ is valid at time 15.04.” is formalized as follow:
- *S1: is_obligatory('Anzai',deliver('Anzai','Bernard'),goods).*
- *S2: is_valid(s1,t04_15).*
- It is to be noted here that the object sentence is formalized as an entity which has it unique name.
- Anzai’s obligation to deliver the goods to Bernard turns up at time 04_09 ” means
- “‘It is obligatory for Anzai that Anzai deliver the goods to Bernard’ becomes valid,” which is formalized:
- *S2: become_valid(s1,t04_09).*
- Anzai’s obligation to deliver the goods to Bernard is expired at time 05_01 means “‘It is obligatory for Anzai that Anzai deliver the goods to Bernard’ is terminated at t05_01,” which is formalized:
- *S2: is_terminated(s1,t05_01).*

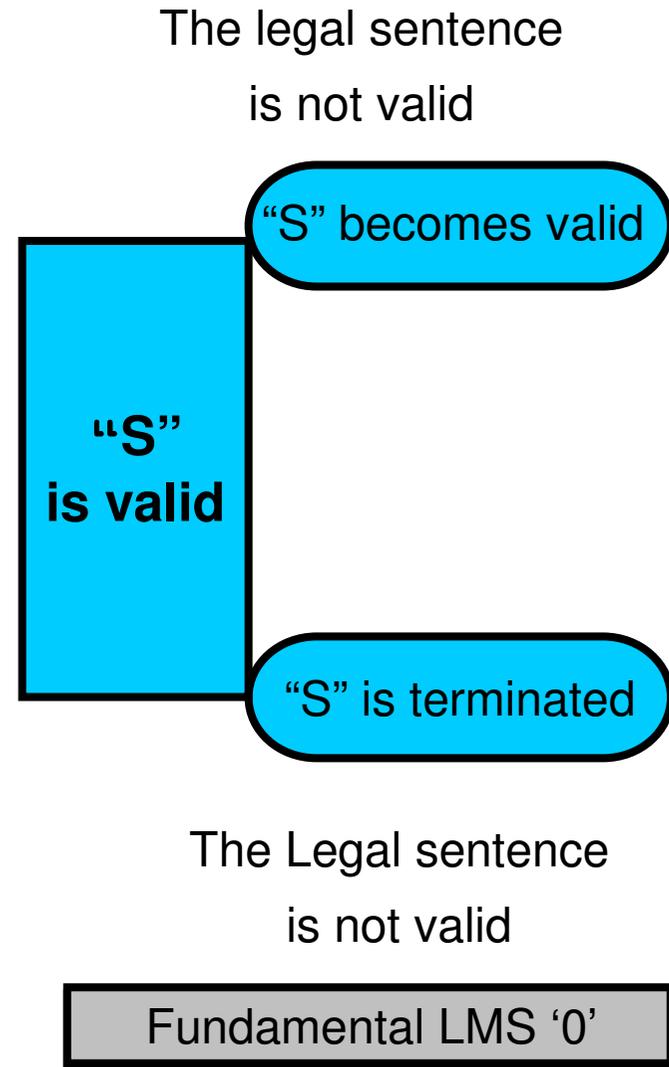
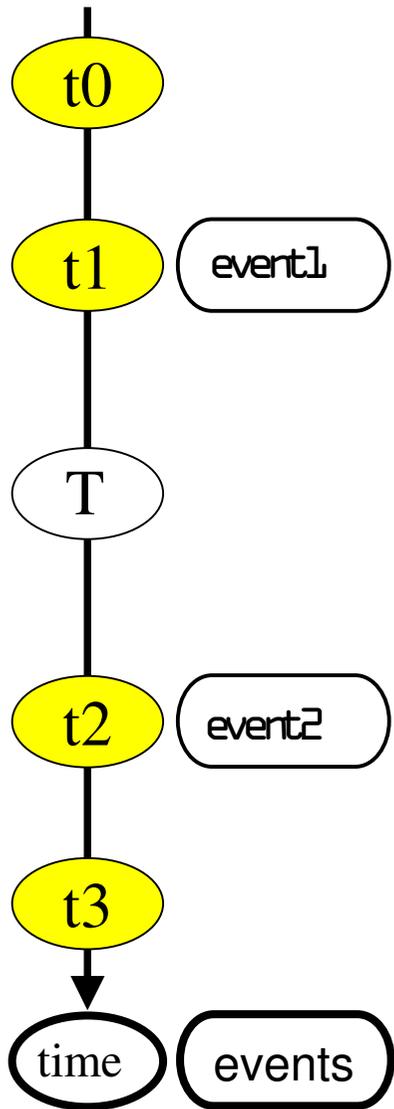
Formalization of a change of legal relation



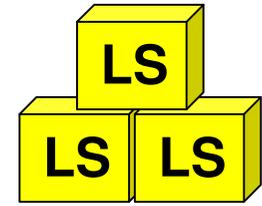
Legal State of Affairs are represented with legal object sentences whose validity are proved.

- The legal meta sentences which describe the validity of object sentences are to be proved through legal reasoning.
- The whole legal object sentences, the validity of which are proved, represent the whole legal obligations.
- The legal reasoning to decide the validity of legal sentences is called legal meta inference, because it infer the validity “about” legal sentences.
- In legal meta inference, legal meta rule sentences are to be applied.
- What is legal meta rules sentences which decide the validity of legal sentences?

Formalization of decision that a LS is valid



Structure of Connection of LS: (4)



Connection of LMS with LMS

State, Law

LJ - Logical Jurisprudence

LMS
Legal Meta Sentence

LMS
Legal Meta Sentence

LRS
Legal Rule Sentence

Stage of Rights and Duties

Scientific Audience

FLMRS

**Fundamental Legal
Meta Rule Sentence**

Fundamental legal meta rule sentence - FLMRS

*A legal sentence S is valid for a goal G at the time $T \iff$
 S becomes valid for G at time $T1$ before T & \square
 $\text{not}(S \text{ is terminated for } G \text{ after } T1 \text{ and before } T).$*

This is a fundamental legal meta rule sentence
implicitly taken for granted **all regulations**.

All other (positive) legal rule sentences regulate the
fulfillment of the first requirement (S becomes valid)
or the second requirement (S is terminated)
of this rule.

State, Law

all Regulations

LJ - Logical Jurisprudence

**FLMRS Fundamental
Legal Metarule Sentence**

**MRS
Legal Metarule Sentence**

**LRS
Legal Rule Sentence**



Stage of Rights and Duties

Scientific Audience

BLRS

Basic Legal Rule Sentence

→ Validity of the final highest legal meta sentence

Final founding the validity LS law through Basic Legal Rule Sentence

BLRS

The validity of the final, highest legal meta sentence, whose validity can not be deduce through the application of legal meta rule sentences, is called the basic legal meta rule sentence (BLRS).

The **validity** of the basic legal meta rule sentence **is to be presupposed,** namely asserted as a fact sentence.

Metalevel

BLRS
Basic Legal
Rule Sentence

LJ - Logical Jurisprudence

FLMRS Fundamental
Legal Metarule Sentence

MRS
Legal Metarule Sentence

LRS
Legal Rule Sentence

State, Law

Stage of Rights and Duties

Scientific Audience

*Comparison
of the results
of LJ with PL*

Comparison of the results of LJ with PL

Kelsen

PL - Pure Theory

„School“

Yoshino

State, Law

Stage of Rights and Duties

LJ - Logical Jurisprudence

Computer-Application

Kelsen

PL - Pure Theory

Basic Norm

„School“

Yoshino

LJ - Logical Jurisprudence

Basic LRS

**Fundamental
LMRS**

Computer-Application

similar solutions at the top of the system

State, Law

Stage of Rights and Duties

Textuality

Kelsen

PL - Pure Theory

Legal Sentence



Legal Norm

Norm as a special Meaning

State, Law

„School“

Stage of Rights and Duties

Formal Logic

Yoshino

LJ - Logical Jurisprudence

LMS

LRS

LOS

LFS

differentiation of juridical sentences

Computer-Application

Textuality

Kelsen

PL - Pure Theory

„School“

Formal Logic

Yoshino

LJ - Logical Jurisprudence



Computer-Application

State, Law

**LJ → Modelling
Legal Cases**

Stage of Rights and Duties



Formal Logic

Yoshino

State, Law

LJ - Logical Jurisprudence

LMS

LRS

LOS

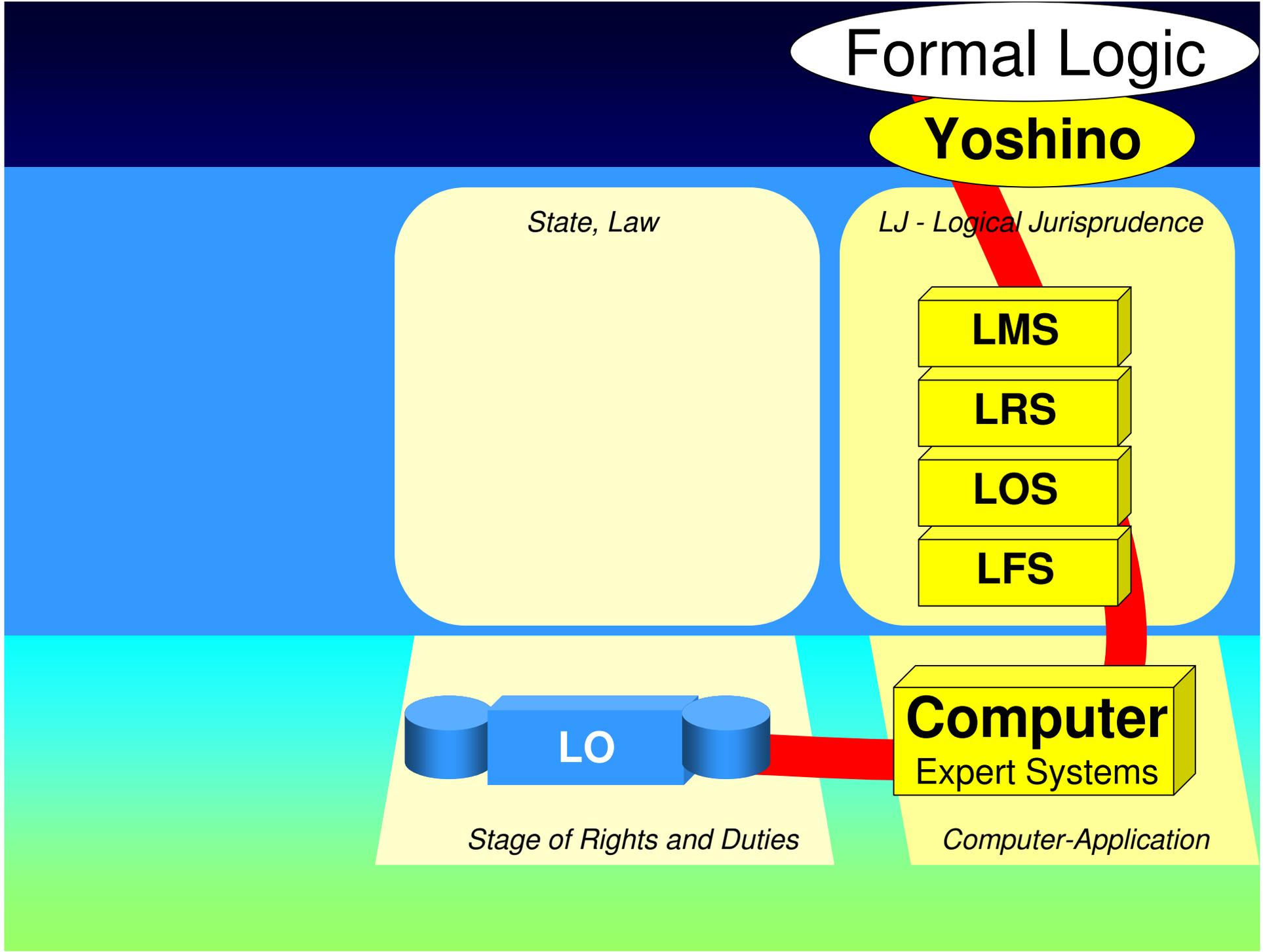
LFS

LO

Computer
Expert Systems

Stage of Rights and Duties

Computer-Application



Formal Logic

Yoshino

State, Law

LJ - Logical Jurisprudence

further supplement of LJ:
→ Legal Ontologies

LMS

LRS

LOS

LFS

LO

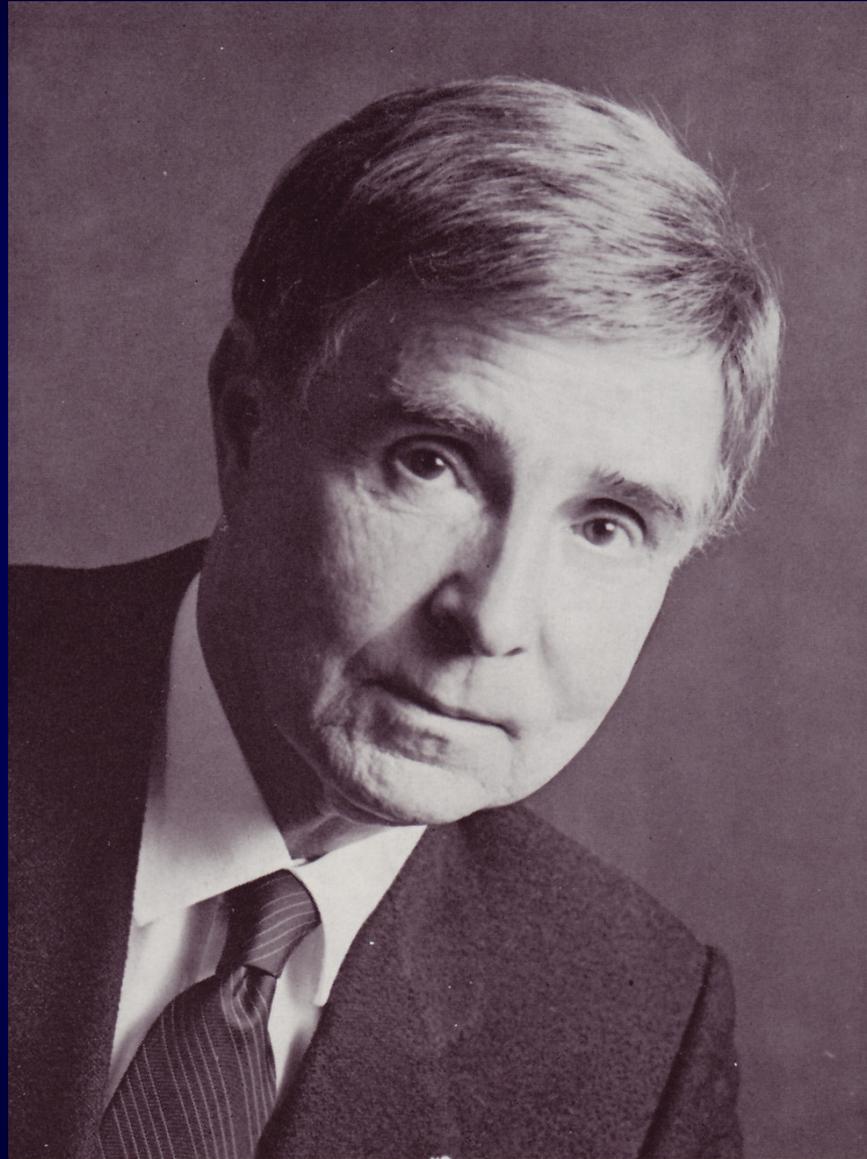
Computer
Expert Systems

Stage of Rights and Duties

Computer-Application

This lecture is dedicated to the memory of

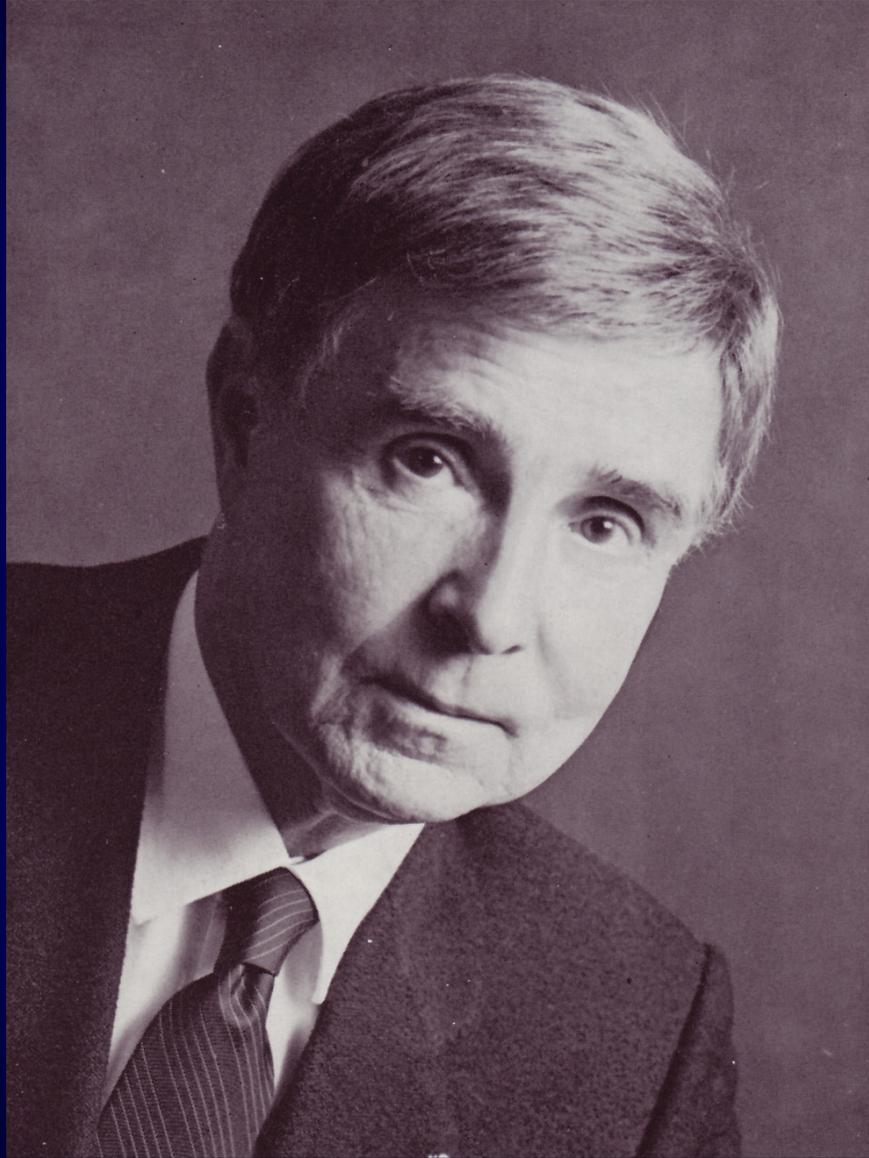
This lecture is dedicated to the memory of



the famous Estonian Legal Philosopher

*Thank you
for your
Attention!*

Lachmayer @ chello.at



Conclusion: Summary

LJ starts from three primitives (legal sentence, validity, inference rule) and analyze and construct a legal system in terms of thee types of alternative basic concept of legal sentence.

LJ insists that the systemicity of law is constituted through legal reasoning.

LJ provided a logical model according to which legal system is actually explained as a deductive system.

Conclusion: Summary

LJ clarified thereby not only 'basic rule sentences' but also fundamental legal meta rules sentences.

LJ make it enable to realize inference of validity relationship between legal sentences in terms of meta rule sentences and meta inference.

LJ contributes to develop a deductive legal knowledge base.

LJ may contribute to develop a true science of
law

LJ

**Legal
Reasoning**

Annex: The Structure of Legal Reasoning as Developing Process of Legal Sentences

(This scheme could also be visualized in the mentioned manner)

