C U R S O S E C O N G R E S O S

VII Conference of the Spanish Society for Logic, Methodology and Philosophy of Science

VII Congreso de la Sociedad de Lógica, Metodología y Filosofía de la Ciencia en España

Santiago de Compostela
18-20 July 2012
18-20 de julio de 2012

Edited by
Concha Martínez Vidal
José L. Falguera
José M. Sagüillo
Víctor M. Verdejo
M. Pereira-Fariña

UNIVERSIDADE
DE SANTIAGO
DE COMPOSTELA
publicacións

CURSOS E CONGRESOS
DA UNIVERSIDADE DE SANTIAGO DE COMPOSTELA
Nº. 217

VII Conference of the Spanish Society for Logic, Methodology and Philosphy of Science

VII Congreso de la Sociedad de Lógica, Metodología y Filosofía de la Ciencia en España

VII Conference of the Spanish Society for Logic, Methodology and Philosphy of Science

VII Congreso de la Sociedad de Lógica, Metodología y Filosofía de la Ciencia en España

Santiago de Compostela, Spain, 18-20 July 2012

Santiago de Compostela, España, 18-20 de julio de 2012

Edited by

Concha Martínez Vidal

José L. Falguera

José M. Sagüillo

Víctor M. Verdejo

M. Pereira-Fariña

2012

Universidade de Santiago de Compostela

Sociedad de Lógica, Metodología y Filosofía de la Ciencia en España. Congreso (7º. 2012. Santiago de Compostela)
VII Conference of the Spanish Society for Logic, Methodology and Philosphy of Science, Santiago de Compostela, Spain, 18-20 July 2012 = VII Congreso de la Sociedad de Lógica, Metodología y Filosofía de la Ciencia en España, Santiago de Compostela, España, 18-20 de julio de 2012 [Recurso de internet] / edited by Concha Martínez Vidal, José L. Falguera, José M. Sagüillo, Víctor M. Verdejo, M. Pereira-Fariña. — Santiago de Compostela : Universidade de Santiago de Compostela, Servizo de Publicacións e Intercambio Científico, 2012
(Cursos e congresos da Universidade de Santiago de Compostela ; 217)
Formato PDF
Requisitos do sistema : Adobe Acrobat Reader
Modo de acceso : Internet repositorio Minerva, http://dspace.usc.es/ (15-07-12)

1. Ciencias — Metodoloxía — Congresos I. Martínez Vidal, Concha, ed. lit. II. Falguera, José L., ed. lit. III. Sagüillo, José M., ed. lit. IV. Verdejo, Víctor M., ed. lit. V. Pereira-Fariña, M., ed. lit. VI. Universidade de Santiago de Compostela. Servizo de Publicacións e Intercambio Científico, ed.

001.8:061.3(461.11 Santiago de Compostela)

http://hdl.handle.net/10347/5853

This work is under a Creative Commons BY-NC-SA 3.0 license.
Any form of reproduction, distribution, public communication or transformation of this work not included under the Creative Commons BY-NC-SA 3.0 license can only be carried out with the express authorization of the proprietors, save where otherwise provided by the law.
You can access the full text of the license by clicking on the following link:
http://creativecommons.org/licenses/by-nc-sa/3.0/

Esta obra se encuentra bajo una licencia Creative Commons BY-NC-SA 3.0.
Cualquier forma de reproducción, distribución, comunicación pública o transformación de esta obra no incluida en la licencia Creative Commons BY-NC-SA 3.0 solo puede ser realizada con la autorización expresa de los titulares, salvo excepción prevista por la ley.
Puede acceder Vd. al texto completo de la licencia haciendo clic en este enlace:
http://creativecommons.org/licenses/by-nc-sa/3.0/es/legalcode.es

© Universidade de Santiago de Compostela, 2012

http://hdl.handle.net/10347/5853

Maquetación
Emanuela Saladini

Edita
Servizo de Publicacións e Intercambio Científico
Campus Vida
15782 Santiago de Compostela
usc.es/publicacions

INDEX / ÍNDICE

Preface 1
Prefacio..... 3
Premio para Jóvenes Investigadores..... 5

Contributed papers / Comunicaciones 1

1. LOGIC, HISTORY AND PHILOSOPHY OF LOGIC / LÓGICA, HISTORIA Y FILOSOFÍA DE LA LÓGICA 2

MARTIN ANDOR: Inferentialism and Expressivism about Logical Vocabulary in Frege 3

JOHN CORCORAN and JOSÉ SAGÜILLO: Information-Theoretic Approaches to Logical Relations 11

MANUEL CRESCENCIO MORENO GOMEZ: La Historia de la Lógica como la Historia de los Argumentos Ontológicos 16

JOAQUÍN DÍAZ BOILS: La Jerarquía de Grzegorzcyk por comprensiones categoriales 27

EMILIO GARCIA BUENDIA: Abducción y Derecho 46

PIERDANIELE GIARETTA and SILVIA GAIO: Gödel's Syntactical Conventions 53

IGNACIO HERNÁNDEZ-ANTÓN, ENRIQUE SARRIÓN MORILLO and FERNANDO SOLER TOSCANO: Abducción y Semántica de Teoría de Juegos..... 60

JOHN KEARNS: First-person Logical Theories and Third-person Theories 67

JOAN ROSELLÓ: Incompleteness, Undecidability and Platonism in the Work of Kurt Gödel 74

ENRIQUE SARRIÓN-MORILLO, IGNACIO HERNÁNDEZ-ANTÓN and ÁNGEL NEPOMUCENO-FERNÁNDEZ: Tratamiento multimodal de contextos..... 81

JOSÉ PEDRO UBEDA RIVES: Una lógica epistémica bidimensional 88

MARGARITA VÁZQUEZ: Tiempo y puntos de vista 95

2. PHILOSOPHY OF LANGUAGE, PHILOSOPHY OF MIND, EPISTEMOLOGY / FILOSOFÍA DEL LENGUAJE, FILOSOFÍA DE LA MENTE, EPISTEMOLOGÍA 101

JUAN JOSÉ ACERO FERNÁNDEZ and NEFTALÍ VILLANUEVA FERNÁNDEZ: Wittgenstein's Anti-descriptivism …..... 102

SILVIA ANDRÉS BALSERA: Unidad conceptual versus multiplicidad de grupos de deferencia 109

MARC ARTIGA GALINDO: The Singular Thought Strategy and the Content of Perception …..... 114

ANTONIO BENÍTEZ and EMILIO GARCÍA BUENDÍA: El Modelo Animat en la Inteligencia Artificial bio-inspirada ……..... 122

EDSON BERND, ANTONIO GAITÁN-TORRES and MANUEL DE PINEDO-GARCIA: Two Kinds of Second Person Authority …..... 132

ANTONIO BLANCO SALGUEIRO: ¿Fue Whorf un neowhorfiano? …..... 139

DAVID BORDONABA and NEFTALÍ VILLANUEVA: Lo que se dice y "decir lo mismo" …..... 147

FERNANDO BRONCANO-BERROCAL: Luck and Fortune, or Why Knowledge Requires Cognitive Control …..... 155

GEMMA CELESTINO FERNÁNDEZ: It Is Not the Case that the Alleged Golden Mountain Exists …..... 162

CRISTINA CORREDOR: Communicative Intentions and Joint Commitments in Speech Acts ……. 170

ANTONIO DUARTE: El arte del diagnóstico: falacias irónicas …..... 177

VICTOR FERNANDEZ: Metarepresentación y Dualismo en la Lectura de Mentes 184

LUIS FERNÁNDEZ MORENO: Nombres propios y términos de género natural: un examen de dos supuestas similitudes 191

EKAIN GARMENDIA: Boghossian's Argument from Inference and Identity Belief Ascriptions 198

HEIMIR GEIRSSON: A Tale of Two Mary's …..... 205

MARIO GÓMEZ-TORRENTE: On quotation and semantic structure …… 212

EDUARDO GONZÁLEZ DE LUNA: Una noción dinámica de la representación mental en el marco de un realismo natural …..... 216

JAVIER GONZALEZ DE PRADO SALAS: Inferentialism, Metaphor and Context 223

MANUEL HERAS-ESCRIBANO and MANUEL DE PINEDO-GARCÍA:
Dispositions, Affordances and Mental Intentionality …..... 230

MARTA JORBA: Concept-aspects and the Specification of Cognitive Phenomenology 236

MANUEL LIZ: Decisiones epistémicas y los límites del naturalismo 241

MANUEL LIZ: "Yo soy George Kaplan". Tres tesis sobre la rigidez semántica..... 246

MIREIA LOPEZ AMO: ¿Es la tesis de la carga teórica de la observación
incompatible con el dogmatismo? 253

JANUSZ MACIASZEK: Metaphor: Meaning, Interpretation and Causation …..... 261

MANUEL PÉREZ OTERO: Argumentación racional sin transmisión de la justificación 269

PABLO RYCHTER: Presentism, Truthmaking, and Laws of Nature …..... 274

UXÍA RIVAS MONROY: Creencia, conocimiento y verdad: el enfoque
lógico-semántico de Frege y Russell y el pragmatista de Peirce y James 280

MARÍA ESPERANZA RODRÍGUEZ ZARAGOZA: ¿Qué hay detrás de un argumento?
La distinción objetividad-subjetividad mostrada a través de la distinción entre desacuerdo
perdido y desacuerdo legítimo ….... 287

SERGI ROSELL: Voluntary Belief on a Strictly Epistemic Basis? …..... 295

JONATHAN SUROVELL: Carnap's Principle of Tolerance:
Rejection or Neglect of Language 300

BARBARA TRYBULEC: Is Naturalism Normative? Some Problems with Naturalizing
Epistemic Normativity …..... 308

VÍCTOR M. VERDEJO: Unbelievably Good Norms …..... 316

IGNACIO VICARIO: El rompecabezas de la atribución de creencias …..... 324

JAVIER VILANOVA: La percepción del aspecto en las Investigaciones Filosóficas 331

3. PHILOSOPHY AND METHODOLOGY OF SCIENCE / FILOSOFÍA Y METODOLOGÍA DE LA CIENCIA 339

ALBA AMILBURU: Natural Kind Thinking in Philosophy of Science:
a Meta-theoretical Analysis …..... 340

LORENZO BARAVALLE: Extensión del dominio de la teoría de la selección natural:
enfoques sincrónicos y diacrónicos del cambio cultural …..... 343

MARÍA CAAMAÑO: Las anomalías no refutatorias y el alcance del dominio teórico 350

EDUARDO CASTRO: Induction, Laws of Nature and Inference to the Best Explanation 358

GUSTAVO CEVOLANI, VINCENZO CRUPI and ROBERTO FESTA:
A Verisimilitudinarian Analysis of the Linda paradox..... 366

GUSTAVO CEVOLANI and LUCA TAMBOLO: Underdetermination, Realism, and
Truth Approximation …..... 374

JUAN J. COLOMINA: The Feasibility of Determinables
and its Relation to the Scientific Image 382

TIM DE CRAECKER: Causal Explanation in Theories of Probabilistic Causation 389

XAVIER DE DONATO-RODRIGUEZ: Actitudes cognitivas: el caso de la asunción,
particularmente en ciencia ……..…..... 396

ALEX DÍAZ: The Müller-Lyer Visual Illusion: Tricking the Brain or Tricking the Scientist? 403

JOSÉ L. FALGUERA: De los géneros constituidos de Kuhn a los objetos
abstractos de Zalta ……..... 409

M. J. GARCÍA-ENCINAS: Reading "De Interpretatione" 9 417

ANDONI IBARRA and HANNOT RODRÍGUEZ: Gobernanza de riesgos de la
nanomedicina: el caso europeo …..... 424

MARIA JIMENEZ-BUEDO: Experiments in the Social Sciences: Rethinking the
Hawthorne Effect …..... 432

VÍCTOR JOSÉ LUQUE MARTÍN: La Explicación en Biología: entre Leyes y
Modelos Explicativos …..... 437

ALFREDO MARCOS: Implicaciones filosóficas de la biología post-genómica … 444

IGNACIO MARTÍNEZ DE LEJARZA: Medidas probabilistas de apoyo evidencial:
¿pluralidad de medidas o pluralidad de relaciones? …..... 451

THOMAS MEIER: Un marco conceptual para el realismo estructural …..... 465

ELSA MURO and MARÍA CEREZO: Información biomolecular con contenido
semántico. Una perspectiva sistémica 473

VIOREL PÂSLARU: Conceptions of Mechanisms and Insensitivity of Causation 481

DIANA LUZ RABINOVICH: Medición en Psicología. Ponderación de las
concepciones clásicas …..... 489

ANDRÉS RIVADULLA: Theoretical Preduction and Computational
Scientific Discovery …….. 497

CRISTIAN SABORIDO: La problemática naturalización de la normatividad natural.
Organización y malfuncionalidad biológica …..... 505

MARGARITA SANTANA: La discusión del positivismo lógico en la JAE: Blas Cabrera y Julio Palacios …..... 513

IÑAKI SAN PEDRO: Violation of Measurement Independence without Conspiracy 520

IULIAN TOADER: An Outline of Weylean Skepticism …..... 529

NICOLÁS VENTURELLI: Mecanismos, sistemas dinámicos y el Santo Grial de la explicación científico-cognitiva …..... 536

SUSAN VINEBERG: Indispensability and Mathematical Explanation …..... 544

ZENAIDA YANES ABREU: Verdades significantes: o cómo incluir lo político en la ciencia 552

EDUARDO ZUBIA: La lógica de las imágenes: retórica y argumentación en las prácticas científicas representacionales…..... 559

4. HISTORY OF SCIENCE / HISTORIA DE LA CIENCIA 567

CARLOS ALBERTO CARDONA Panofsky: el conflicto entre la perspectiva lineal y la perspectiva angular …..... 568

PABLO RUIZ DE OLANO: Apunte acerca de la filosofía de la ciencia de Blas Cabrera. El papel de Duhem in su defensa de la relatividad 579

ALBERT SOLÉ: Three-dimensionalist Bohmian Mechanics: Does Newton Defeat Aristotle? …….. 587

Mª JOSÉ TACORONTE DOMÍNGUEZ: El planteamiento sobre la mujer: positivistas, krausistas y católicos …….. 595

5. SCIENCE, TECHNOLOGY AND SOCIETY / CIENCIA, TECNOLOGÍA Y SOCIEDAD 603

IRENE DÍAZ GARCÍA: La nueva ley de la ciencia en España: una aproximación crítica al contrato social subyacente …..... 604

MANUELA FERNÁNDEZ PINTO: Aprendiendo de la ignorancia: la agnotología como nuevo enfoque en filosofía de la ciencia …..... 611

BELEN LASPRA: Cultura científica y museos de ciencia: una historia paralela 618

JOSÉ LUIS LUJÁN, OLIVER TODT and JUAN BAUTISTA BENGOETXEA: Las reglas de inferencia como hipótesis empíricas. La información mecanística en la evaluación de riesgos …….. 626

AMPARO ROMERO: El tecnofeminismo de Judy Wajcman. Alcance teórico y político 631

ANA ROMERO DE PABLOS: Las patentes, nuevas fuentes para la historia de la ciencia y los estudios CTS ……. 639

MIGUEL ZAPATA: Los imaginarios colectivos en la representación social de la ciencia 642

Symposia / Simposios …….. 649

1. LOGIC, HISTORY AND PHILOSOPHY OF LOGIC / LÓGICA, HISTORIA Y FILOSOFÍA DE LA LÓGICA 650

JOSÉ FERREIRÓS and MARÍA JOSÉ FRÁPOLLI (coord.), CONCEPCIÓN MARTÍNEZ VIDAL, JOSÉ MIGUEL SAGÜILLO, VALERIA GIARDINO, RAYMUNDO MORADO: Prospects for Practice-based Philosophy of Logic 651

ALEJANDRO SOBRINO and Martín Pereira FARIÑA (coord.), SANTIAGO FERNÁNDEZ, MARÍA NAVARRO: II Seminario Alfredo Deaño sobre Razonamiento Ordinario…… 689

LUIS VEGA-REÑÓN (coord.), BEGOÑA CARRASCAL, XAVIER DE DONATO, HUBERT MARRAUD, RAYMUNDO MORADO, PAULA OLMOS GÓMEZ: Teoria de la argumentación: perspectivas y problemas …..... 726

LUIS VEGA REÑÓN (coord.), ENRIQUE ALONSO Y MIGUEL VIVANCO, LILIAN BERMEJO LUQUE, JOSÉ M. SAGÜILLO: La argumentación en la esfera pública del discurso 763

2. PHILOSOPHY OF LANGUAGE, PHILOSOPHY OF MIND, EPISTEMOLOGY / FILOSOFÍA DEL LENGUAJE, FILOSOFÍA DE LA MENTE, EPISTEMOLOGÍA 784

JUAN COLOMINA and MANUEL LIZ (coord.), FERNANDO CHARRO, DAVID P. CHICO MARGARITA VÁZQUEZ: Puntos de vista …..... 785

JESÚS VEGA ENCABO and VÍCTOR M. VERDEJO (coord.), LAURA ORTEGA CANO, MARÍA MUÑOZ-SERRANO: Semantics and Epistemology of Artifactual Kinds 801

3. PHILOSOPHY AND METHODOLOGY OF SCIENCE / FILOSOFÍA Y METODOLOGÍA DE LA CIENCIA 831

ANTONIO DIÉGUEZ (coord.), PASCUAL MARTÍNEZ-FREIRE, ALVARO MORENO, JON UMEREZ, ARANTZA ETXEBERRIA: Mecanismos y modelos en biología y en ciencias cognitivas …..... 832

RODOLFO GAETA (coord.), NELIDA GENTILE, SUSANA LUCERO: Realismo y antirrealismo científicos: el caso de las leyes 868

4. SCIENCE, TECHNOLOGY AND SOCIETY / CIENCIA, TECNOLOGÍA Y SOCIEDAD **890**

EULALIA PÉREZ SEDEÑO and MARÍA JESÚS SANTESMASES (coord.), ANA TOLEDO, CARMEN ROMERO, MARÍA GONZÁLEZ AGUADO, LORENA RUIZ MARCOS: Cartografías del cuerpo: biopoliticas de la ciencia y la tecnología I Simposio…..... 891

MARÍA JESÚS SANTESMASES and EULALIA PÉREZ SEDEÑO (coord.), MARÍA JOSÉ MIRANDA, ESTHER ORTEGA, SILVIA GARCÍA DAUDER , CARMEN ROMERO: Cuerpos en tránsito: biopolíticas de la ciencia y la tecnología II Simposio 918

PREFACE

Preface

This book comprises the works accepted to be presented at the VII Congress of the Society of Logic, Methodology and Philosophy of the Science in Spain (SLMFCE), celebrated in Santiago de Compostela, July 18th-20th, 2012. That is to say, it contains the contributions and symposia accepted for the different sections of the Congress. The volume incorporates a wide and representative sample of the research done in our country in the fields of logic, philosophy of science, philosophy of language, philosophy of mind, epistemology, history of science, and in science, technology and society. Besides, more than a third of the works received came from other parts of the world (Australia, United States and several countries in Latin America and Europe). This confirms the tendency to internationalization of the conferences of the SLMFCE, a tendency already initiated in previous editions. This is a good sign of the potential of these events to open and preserve communication between researchers of different countries.

All the proposals received were subjected to a process of blind refereeing. This process involved a good number of scholars from different countries and research interests as the composition of the Scientific Committee shows. The global rate of acceptance has been 74 percent, although this rate depended on the section and was lower in the sections of the congress with a larger number of contributions (Philosophy and Methodology of Science, and Philosophy of Language, Philosophy of Mind, Epistemology).

A novelty in this seventh edition of the Congress of the Society for Logic, Methodology and Philosophy of Science in Spain was the celebration of the first edition of a series of plenary lectures, the LULLIUS LECTURES. These lectures constitute an excellent tool by which distinguished philosophers can present their latest results to our Society. In this first edition the LULLIUS LECTURES have been honored with the presence of Professor Philip Kitcher, from the University of Columbia.

Besides, and to encourage the work of young researchers, the SLMFCE summoned the second edition of the prize "FINANCIAL SUPPORT FOR YOUNG RESEARCHERS". In this edition, there were 17 applications.

The editors would like to thank the institutions whose financial support made this event possible: Ministerio de Economía y Competitividad, Universidade of Santiago de Compostela, and the Society for Logic, Methodology and Philosophy of Science in Spain.

The editors would also like to show their gratitude to the rest of members of the Organizing Committee, and to those who collaborated in the refereeing process, including indeed the Scientific Committee. Finally, we would like to thank the members of the board of the Society for Logic, Methodology and Philosophy of Science in Spain, for their advice and constant support, and all participants in the Conference for their contribution to its success.

The editors
Concha Martínez Vidal, José L. Falguera, José M. Sagüillo, Víctor M. Verdejo y M. Pereira-Fariña

Santiago de Compostela, July 10th 2012

A VEROSIMILITUDINARIAN ANALYSIS OF THE LINDA PARADOX

G. CEVOLANI, V. CRUPI, R. FESTA
U. of Bologna, U. of Turin, U. of Trieste

ABSTRACT: The Linda paradox is a key topic in current debates on the rationality of human reasoning and its limitations. We present a novel analysis of this paradox, based on the notion of verisimilitude as studied in the philosophy of science. The comparison with an alternative analysis based on probabilistic confirmation suggests how to overcome some problems of our account by introducing an adequately defined notion of *verisimilitudinarian* confirmation.

Key words: Conjunction fallacy, Linda paradox, Verisimilitude, Truthlikeness, Probability, Confirmation, Verisimilitudinarian confirmation.

The notion of verisimilitude or truthlikeness of a scientific theory was introduced by Karl Popper, who claimed that the main epistemic goal of science is truth approximation and that scientific progress consists in devising new theories which are closer to the truth than preceding ones (Popper, 1963). It was then extensively explored in post-Popperian theories of verisimilitude (Niiniluoto, 1987; Kuipers, 2000; Oddie, 2008). In what follows, we further pursue this line of research, by showing how a *verisimilitudinarian* analysis can be fruitfully applied also to problems emerging at the interface between epistemology and the cognitive sciences. More precisely, we focus on the so called *Linda paradox*, a key topic in current debates on the rationality of human reasoning and its limitations. In section 1, we present the Linda paradox and briefly survey the different attempts, made by both psychologists and epistemologists, to provide a satisfactory account of this phenomenon. Then, in section 2, we propose a new account based on the notion of (expected) verisimilitude, which generalizes a previous attempt in the same direction (Cevolani et al., 2010). Finally, in section 3, we compare our account with an alternative one based on Bayesian confirmation theory (Crupi et al., 2008; Tentori et al., 2012) and define a notion of *verisimilitudinarian confirmation* allowing to overcome some of the limitations of the former.

1 The Linda paradox

In a seminal work on the psychology of reasoning and judgment under uncertainty, Amos Tversky and Daniel Kahneman presented the following description of a fictitious character, Linda, which would

then become famous (Tversky & Kahneman, 1983, 297):

> Linda is 31 years old, single, outspoken and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations.

In a series of experimental inquiries, Tversky and Kahneman asked several samples of participants (both statistically naïve and sophisticated subjects) to judge the probability of some hypotheses about Linda, including the isolated statement "Linda is a bank teller" (b from now on) and the conjunctive statement "Linda is a bank teller and is active in the feminist movement" ($b \wedge f$). The results showed a strong tendency to judge $b \wedge f$ as more probable than b. In a particularly neat demonstration of the phenomenon, 142 university students were simply asked to choose the more probable state of affairs between b and $b \wedge f$: 85% of them chose the latter. This pattern of judgments is puzzling in that it conflicts with a basic and uncontroversial principle of probability theory, known as the "conjunction rule", prescribing that a conjunction of statements can not be more probable than any of its conjuncts. This "Linda paradox" is only an instance of a widespread and well documented phenomenon, usually known in the literature as the "conjunction fallacy" or the "conjunction effect". Indeed, Tversky and Kahneman themselves, along with many others in subsequent investigations, were able to replicate this phenomenon in a variety of experimental scenarios, including real-life cases like, for instance, examples of medical prognosis (Tversky & Kahneman, 1983, 301).

In the last decades, scholars interested in the analysis of human reasoning and decision making under uncertainty devoted a great deal of attention to the Linda paradox (Hertwig & Gigerenzer, 1999; Samuels et al., 2002). However, the attempt of providing a satisfactory account of the phenomenon has proved rather challenging. The psychological literature has mainly focused on whether and how the effect is modulated by several variants of the experimental task (see, for example, (Wedell & Moro, 2008)). Interestingly, ever since Isaac Levi's insightful review of Kahneman, Slovic, and Tversky's influential work (1982), the Linda paradox has attracted the attention of a number of epistemology scholars (Levi, 1985; Bovens & Hartmann, 2003; Hintikka, 2004; Crupi et al., 2008; Peijnenburg et al., 2012). Their accounts can all be seen as attempts to flesh out the otherwise esoteric statement by Tversky and Kahneman themselves that "*feminist bank teller* is a better hypothesis about Linda than *bank teller*" (Tversky & Kahneman, 1983, 311). In what follows, we will explore a different strategy to account for this noteworthy remark by providing a verisimilitudinarian analysis of the problem. In a nutshell, we will show that "feminist bank teller", while less likely to be *true* than "bank teller", may well be more likely to be a better approximation to the *whole truth* about Linda.

2 A verisimilitudinarian account of the Linda paradox

2.1 Verisimilitude vs probability

In general terms, a statement, hypothesis or theory h is highly verisimilar if it says many things about the target domain, and if many of these things are (almost exactly) true. Thus, the (degree of) verisimilitude of h must depend on both its *content*, i.e., how much h says, and its *accuracy*, i.e., how much of what h says is in fact true. In Popper's words, verisimilitude "represents the idea of approaching comprehensive truth. It thus combines truth and content" (Popper, 1963, p. 237).

An important consequence of the fact that verisimilitude is a combination of truth and content — or a "mixture of truth and information" (Oddie, 1986, 12) — is that the notions of verisimilitude and probability have to be carefully distinguished. In particular, it is possible that h is expected to be quite close to the whole truth about the domain, but still h is not expected to be true, i.e., h is not probable. In fact, while (conditional) probability is a *decreasing* function of content, (expected) verisimilitude must be *positively* associated to high content. This is simply because "nothing is as close to the truth as the whole truth itself" (Oddie, 1986, 11), the latter clearly being a uniquely accurate *and exhaustive* description of a given matter of interest.[1]

This last remarks suggests how a verisimilitudinarian account of the Linda paradox can work. The basic idea is that experimental participants may judge $b \wedge f$ a better hypothesis about Linda as compared to b because they evaluate $b \wedge f$ as more verisimilar than b (Cevolani et al., 2010). In fact, the hypothesis "feminist bank teller", while less likely to be true than "bank teller", may well be evaluated as a better approximation to the whole truth about Linda. In this connection, it is perhaps surprising that — even without mentioning the idea of verisimilitude, of which they were probably unaware — Tversky and Kahneman themselves anticipated the basic intuition underlying a verisimilitudinarian analysis of the Linda paradox, as the following telling quotation reveals (Tversky & Kahneman, 1983, 312):

> The expected value of a message can sometimes be improved by increasing its content, although its probability is thereby reduced. [...] Consider the task of ranking possible answers to the question "What do you think Linda is up to these days?" The maxim of value could justify a preference for $b \wedge f$ over b in this task, because the added attribute *feminist* considerably enriches the description of Linda's current activities at an acceptable cost in probable truth.

[1] More precisely, if h logically entails g, but g does not entail h, then h is less probable, but may well be more verisimilar, than g. Indeed, if h and g are both true, and h is logically stronger than g, then h is more verisimilar than g according to most verisimilitude theorists (an exception being (Oddie, 1986)).

In other words, we suggest that experimental participants are assessing the expected verisimilitude, not the probability, of the two hypotheses involved in the Linda problem, and that this can explain their preference for $b \wedge f$ over b.

2.2 Expected verisimilitude of conjunctive hypotheses

To illustrate our analysis, we introduce a general framework to address the Linda paradox, based on the so-called basic feature approach to verisimilitude (Cevolani et al., 2011). This approach focuses on *conjunctive hypotheses*, i.e., hypotheses expressed as conjunctions of logically independent atomic statements of a language $\mathscr{L}$ describing a target domain $\mathscr{U}$. The (degree of) verisimilitude $Vs(h)$ of a conjunctive hypothesis h expresses the closeness or similarity of h to "the whole truth" about $\mathscr{U}$, construed as the most complete true description of the basic features of $\mathscr{U}$ in $\mathscr{L}$. Since, in most interesting cases, the whole truth is simply unknown, the estimated verisimilitude of competing hypotheses, not their actual verisimilitude, is the crucial point of interest. Accordingly, the (degree of) expected verisimilitude $EVs(h|e)$ of h on e expresses its estimated degree of closeness to the truth with respect to the available evidence e (Oddie, 1986; Niiniluoto, 1987). Given an epistemic probability distribution $p(\cdot)$ over the set of the relevant alternative states of affairs (possible worlds) $c_1, \ldots, c_n$ and a measure $Vs(h, c_i)$ of the closeness of h to a given state of affairs c_i, $EVs(h)$ is defined as follows:

$$EVs(h|e) = \sum_{c_i} Vs(h, c_i) \times P(c_i|e) \tag{1}$$

We suggest that, in order to account for the Linda paradox, one should focus on the expected verisimilitude of the two (conjunctive) hypotheses involved — i.e., on $EVs(b|e)$ and $EVs(b \wedge f|e)$, where e is Linda's description—, and on their relationship.

Verisimilitude theorists have proposed a number of (partially conflicting) measures Vs of verisimilitude. Most of these measures, however, agree with each other as far as the verisimilitude of a conjunctive hypotheses h is concerned. In particular, most of them are *monotonic* in the sense that the verisimilitude of h increases with the addition of true conjuncts, and decreases with the addition of false conjuncts (Cevolani et al., 2011, 187). As an example, a monotonic verisimilitude measure Vs would order the two hypotheses involved in the Linda scenario as follows:

$$\begin{aligned} &\text{if } f \text{ is true in } c_i\text{, then} \quad Vs(b \wedge f, c_i) > Vs(b, c_i) \\ &\text{if } f \text{ is false in } c_i\text{, then} \quad Vs(b \wedge f, c_i) < Vs(b, c_i) \end{aligned} \tag{2}$$

One can then prove that, under suitably defined conditions, for all monotonic verisimilitude measures

Vs:[2]

$$EVs(b \wedge f|e) > EVs(b|e) \text{ iff } P(f|e) > \sigma \tag{3}$$

where σ is a threshold value depending on the specific measure *Vs*. In words, if "Linda is a feminist" is sufficiently likely to be true given Linda's story (i.e., $P(f|e) > \sigma$), "feminist bank teller" is estimated as more verisimilar than "bank teller" alone. This makes the former a better hypothesis about Linda than the latter, thus explaining both people's preferences and Tversky and Kahneman's "esoteric" remark quoted in section 1.

3 Verisimilitude and confirmation

According to the analysis presented in the previous section, people tend to prefer "feminist bank teller" ($b \wedge f$) over "bank teller" alone (b) because they judge f sufficiently probable given Linda's story (e) and hence evaluate $b \wedge f$ as a better approximation to the whole truth about Linda than b.

As one can see from theorem 3, the relatively high probability of f given e is considered as the main factor underlying the Linda paradox. This is a point that the present analysis has in common with most alternative accounts of this phenomenon. However, this aspect of the verisimilitudinarian account is problematic, as the following case shows (Tentori et al., 2012). Suppose that a new item of information is added in the Linda scenario, i.e., the statement that "Linda owns an umbrella" (u). It seems clear that u is extremely likely to be true (since almost everybody owns an umbrella) and at least as probable as f, even on the background assumption that e. Accordingly, by the same pattern of reasoning described above, participants should prefer $b \wedge u$ over b alone as an hypothesis about Linda. In fact, one can see from theorem 3 that $b \wedge u$ is estimated as more verisimilar than b when $P(u) > \sigma$. In turn, since we are assuming that $P(u) \geq P(f)$, inequality $P(u) > \sigma$ holds whenever $P(f) > \sigma$. It follows that participants should prefer $b \wedge u$ to b whenever they prefer $b \wedge f$ to b.

The problem with this account is that, although f and u are both highly probable given e, only the former is *confirmed* by e, in the sense that its probability is increased by e. On the contrary, we can assume that the probability of u remains unchanged after learning e. Indeed, recent experimental investigations (Tentori et al., 2012) show that, when u is added in the Linda scenario, participants are much less prone to the conjunction fallacy; more precisely, the number of subjects preferring $b \wedge u$ to b is much lesser than the number of those judging $b \wedge f$ a better hypothesis than b about Linda.

A possible explanation of these results is that the key variable that generates the effect is not the high *posterior probability* of the added conjunct (like f or u), but the (*probabilistic*) *confirmation*

[2]Proofs are omitted through the paper; for details, see (Cevolani et al., 2012).

that the added conjunct receives from Linda's story. In general terms, the (degree of) confirmation $c(h,e)$ given by evidence e to hypothesis h expresses how much the probability of h increases (or decreases) once e is learned (Festa, 1999; Crupi & Tentori, 2012). As an example, the well-known "difference measure" of confirmation is defined as follows (Carnap, 1962, 361):

$$c(h,e) = p(h|e) - p(h) \tag{4}$$

Note that $c(h,e)$ is positive if and only if $P(h|e) > P(h)$, i.e., if the probability of h is increased by e. According to the "confirmation account" of the Linda paradox (Crupi et al., 2008), participants are not assessing the probability of the hypotheses at issue, but their confirmation given Linda's story. Under suitably defined conditions, this account can explain why participants prefer $b \wedge f$, but not $b \wedge u$, to b as an hypothesis about Linda. Indeed, this preference might be due to the fact that $c(b \wedge f, e) > c(b,e)$ while $c(b \wedge u, e) \leq c(b,e)$.

The intuitions underlying the confirmation account presented above and the verisimilitudinarian account of section 2 can be interestingly combined in what might be called the *verisimilitudinarian confirmation* account (*vs-confirmation* account for short) of the Linda paradox. The basic idea is that people might be assessing neither the verisimilitude, nor the confirmation, of the hypotheses involved in the Linda problem, but their vs-confirmation, which can be defined for instance as follows (cf. definition 4): given a verisimilitude measure Vs,

$$c_{Vs}(h,e) = EVs(h|e) - EVs(h) \tag{5}$$

Note that $c_{Vs}(h,e)$ is positive if and only if $EVs(h|e) > EVs(h)$; in other words, $c_{Vs}(h,e)$ expresses how much the expected verisimilitude of hypothesis h increases (or decreases) on the basis of evidence e.

According to the vs-confirmation account, "feminist bank teller" would be preferred to "bank teller" alone just in case $c_{Vs}(b \wedge f, e)$ were greater than $c_{Vs}(b,e)$, i.e., whenever $EVs(b \wedge f)$ is increased by e more than $EVs(b)$. One obtains a particularly interesting application of this account if definition 5 of vs-confirmation is phrased in terms of so called *additive* verisimilitude measures Vs. A measure Vs is additive when it is monotonic and, given a conjunctive hypothesis $h = h_1 \wedge \cdots \wedge h_k$ (where h_i are logically independent atomic statements), $Vs(h) = \sum_{h_i} Vs(h_i)$. Thus, for instance, if Vs is additive

then $Vs(b \wedge f) = Vs(b) + Vs(f)$.[3] One can then prove that, for all additive verisimilitude measures Vs,

$$c_{Vs}(b \wedge x, e) \gtreqless c_{Vs}(b, e) \text{ iff } c(x, e) \gtreqless 0 \tag{6}$$

i.e., that $b \wedge x$ is vs-confirmed by e more than b just in case the added conjunct x is (probabilistically) confirmed by e. An attractive feature of the vs-confirmation analysis of the Linda paradox is that it can easily accommodate the umbrella case. In fact, such case was originally introduced in order to suggest that f is confirmed by e while u is not, i.e., that the following inequalities hold: $c(f, e) > 0 \geq c(u, e)$. By theorem 6, this implies that $b \wedge f$, but not $b \wedge u$, is more vs-confirmed by e than b, i.e., that $c_{Vs}(b \wedge f, e) > c_{Vs}(b, e) \geq c_{Vs}(b \wedge u, e)$. In turn, this provides an explanation for the participants' preferences based on the notion of verisimilitudinarian confirmation.

Acknowledgements

Gustavo Cevolani and Vincenzo Crupi acknowledge financial support by Grant CR 409/1-1 to Vincenzo Crupi from the *Deutsche Forschungsgemeinschaft* (DFG) as part of the priority program "New Frameworks of Rationality" (SPP 1516).

REFERENCES

Bovens, L. & Hartmann, S. (2003). *Bayesian epistemology*. Oxford: Oxford University Press.

Carnap, R. (1962). *Logical Foundations of Probability*. Chicago: University of Chicago Press. First edition: 1950.

Cevolani, G., Crupi, V., & Festa, R. (2010). The whole truth about Linda: probability, verisimilitude and a paradox of conjunction. In M. D'Agostino, G. Giorello, F. Laudisa, T. Pievani, & C. Sinigaglia (Eds.), *SILFS New Essays in Logic and Philosophy of Science* (pp. 603–615). London: College Publications.

Cevolani, G., Crupi, V., & Festa, R. (2011). Verisimilitude and belief change for conjunctive theories. *Erkenntnis*, *75*(2), 183–202.

Cevolani, G., Crupi, V., & Festa, R. (2012). A novel analysis of the linda paradox. Manuscript.

Crupi, V., Fitelson, B., & Tentori, K. (2008). Probability, confirmation and the conjunction fallacy. *Thinking and Reasoning*, *14*, 182–199.

Crupi, V. & Tentori, K. (2012). Confirmation theory. In A. Hájek & C. Hitchcock (Eds.), *The Oxford Handbook of Philosophy and Probability*. Oxford: Oxford University Press. Forthcoming.

Festa, R. (1999). Bayesian confirmation. In M. C. Galavotti & A. Pagnini (Eds.), *Experience, Reality, and Scientific Explanation*. Dordrecht: Kluwer Academic Publishers.

Hertwig, R. & Gigerenzer, G. (1999). The 'conjunction fallacy' revised: How intelligent inferences look like reasoning errors. *Journal of Behavioral Decision Making*, *12*, 275–305.

Hintikka, J. (2004). A fallacious fallacy? *Synthese*, *140*, 25–35.

[3] A family of additive verisimilitude measure is provided by so called *feature contrast measures* of verisimilitude (Cevolani et al., 2011).

Kuipers, T. A. F. (2000). *From Instrumentalism to Constructive Realism*. Dordrecht: Kluwer Academic Publishers.

Levi, I. (1985). Illusions about uncertainty. *British Journal for the Philosophy of Science*, *36*, 331–340.

Niiniluoto, I. (1987). *Truthlikeness*. Dordrecht: Reidel.

Oddie, G. (1986). *Likeness to truth*. Dordrecht: Reidel.

Oddie, G. (2008). Truthlikeness. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy*.

Peijnenburg, J., Fitelson, B., & Douven, I. (Eds.). (2012). *Special issue on "Probability, Confirmation and Fallacies"*. *Synthese*, 184.1.

Popper, K. R. (1963). *Conjectures and Refutations*. London: Routledge and Kegan Paul.

Samuels, R., Stich, S., & Bishop, M. (2002). Ending the rationality wars: How to make disputes about human rationality disappear. In R. Elio (Ed.), *Common Sense, Reasoning and Rationality* (pp. 236–268). New York: Oxford University Press.

Tentori, K., Crupi, V., & Russo, S. (2012). On the determinants of the conjunction fallacy: Probability vs. inductive confirmation. *Journal of Experimental Psychology: General*. Forthcoming.

Tversky, A. & Kahneman, D. (1983). Extensional versus intuitive reasoning: the conjunction fallacy in probability judgment. *Psychological Review*, *90*, 293–315.

Wedell, D. H. & Moro, R. (2008). Testing boundary conditions for the conjunction fallacy: effects of response mode, conceptual focus, and problem type. *Cognition*, *107*(1), 105–136.

C U R S O S E C O N G R E S O S
Nº 2 1 7

SCIENTIFIC COMMITEE/ COMITÉ CIENTÍFICO

Juan José Acero (Universidad de Granada) • John Corcoran (Buffalo University, USA) • Javier Echeverría (Ikerbasque/ Universidad del País Vasco) • Manuel García-Carpintero (Universidad de Barcelona) • María Manzano, Grzegorz Malinowski (Universidad de Lódz, Polonia) • C. Ulises Moulines (Ludwig-Maximilians-Universität München, Alemania) • León Olivé Ordoñez (Universidad Autónoma de Madrid) • Stewart Shapiro (Ohio University, USA -St Andrews University, UK)

ORGANISING COMMITTEE/ COMITÉ ORGANIZADOR

Concha Martínez Vidal (Presidenta del Congreso, USC) • José Luis Falguera López (Secretario, USC) • Xavier de Donato (Vocal, USC) • José Miguel Sagüillo Fernández-Vega (Vocal, USC) • María José Frápolli Sanz (Vocal, Universidad de Granada, Presidenta de la SLMFCE) • Pierdaniele Giaretta (Vocal, Universidad degli Studi di Padova, Italia) • Stephen McLeod (Vocal, University of Liverpool, UK) • Sofía Miguens (Vocal, Universidade de Porto, Portugal) • Martín Pérez Pereira (Vocal, USC) • Uxía Rivas Monroy (Vocal, USC) • Alejandro Sobrino Cerdeiriña (Vocal, USC) • Charles Travis (Vocal, King's College, UK/ Univerdidad de Porto) Juan Vázquez Sánchez (Vocal, USC) • Jesús Vega Encabo (Vocal, Universidad Autónoma de Madrid) • Víctor Verdejo Aparicio (Vocal, USC) • Luis Villegas (Vocal, USC) • Inés Pan Espiñeira (Vocal, USC)

First edition Lullius lectures / Primera edición conferencias Lullius
PHILIP KITCHER

Proyectos colaboradores
FFI2009-08828/FISO, FFI2011-13481-E

Sociedad de Lógica, Metodología
y Filosofía de la Ciencia

USC
UNIVERSIDADE
DE SANTIAGO
DE COMPOSTELA