Workshop:

Pruebas y diagramas en lógica y matemática:

Perspectivas históricas y contemporáneas

<u>Lugar:</u> 3 de septiembre de 2018, Sala del Consejo Directivo (2°piso). Facultad de Humanidades y Ciencias, Universidad Nacional del Litoral Santa Fe, Argentina.

<u>Organizado:</u> Grupos de Investigación: "Resultados de imposibilidad en geometría: perspectivas históricas y sistemáticas" (PICT 2017-0443).
CAI + D 2016 "Problemas contemporáneos sobre el realismo en epistemología, gnoseología y filosofía de la matemática" (UNL).

<u>PROGRAMA</u>

	Lunes│ 3 de Septiembre, 2018
14:00 – 15:00	**Federico Raffo Quintana (UNQ – CONICET, Argentina)** "El método de interpolación y el uso de tablas en la *Arithmetica* de John Wallis"
15:00 – 15:15	Pausa/ Coffee break
15:15 – 16:15	**Eduardo N. Giovannini (UNL – CONICET, Argentina)** "From Euclidean to Hilbertean practices: the theories of plane area"

16:15 – 16:45	Pausa / Coffee break
16:45 – 17:45	**John Mumma (California State University at San Bernardino, Estados Unidos)** "The non-logical role of diagrams in proofs"
17:45 – 18:00	Pausa/Coffee break
18:00 – 19:00	**Gisele Dalva Secco (Universidad Federal de Santa María, Brasil)** "From Topology to Combinatorics: Diagrams and Computers in the Four-Color Theorem Proof"

AUSPICIO

Esta actividad es realizada con el apoyo del Departamento de Filosofía, Facultad de Humanidades y Ciencias, UNL, y del IHUCSO – LITORAL, CONICET-UNL.

ABSTRACTS

El método de interpolación y el uso de tablas en la *Arithmetica* de John Wallis

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Es conocida la influencia que ejerció John Wallis en algunos de los más renombrados matemáticos del siglo XVII. A mediados de la década de 1660, Wallis publicó la *Arithmetica infinitorum*, una influyente obra en la que abordó, entre otras cuestiones, el célebre problema de la cuadratura del círculo. En este período, la manera de considerar esta cuestión ya no consistió en el intento de 'resolver' este problema geométrico mediante la 'construcción' de un cuadrado cuya área sea igual a la de un círculo, sino que se pretendía más bien lograr dar una expresión, analítica o aritmética, del área del círculo o de su circunferencia. En esta perspectiva, Wallis se vale de la aritmética de los infinitos para expresar la razón entre un círculo y un cuadrado mediante números. Para ello, en su obra Wallis propuso, entre otras cosas, el 'método de interpolación'. Este método, y en general toda la aritmética de Wallis, se caracteriza por poseer un claro carácter gráfico. La interpolación exige que observemos las tablas adjuntadas por Wallis, sin las cuales el procedimiento no podría entenderse ni realizarse. En este sentido, hay un claro aspecto visual de su método, que ha llevado a autores como Leibniz a señalar: "Mi aritmética de los infinitos es pura, la de Wallis, figurada" (A VII 3, 102). En esta presentación buscaremos exponer los lineamientos generales de la aritmética de Wallis, a los fines de mostrar la importancia del uso de tablas.

From Euclidean to Hilbertean practices: the theories of plane area

Eduardo N. Giovannini

(CONICET, Universidad Nacional del Litoral, Argentina)

The aim of this talk is to analyze the theory of area developed by Euclid in the *Elements* and its modern reinterpretation in Hilbert's influential monograph *Foundations of Geometry*. Particular attention will be bestowed upon the role that two specific principles play in these theories, namely the famous common notion 5 and the geometrical proposition known as De Zolt's postulate. On the one hand, we will be argued that an adequate elucidation of how these two principles are conceptually related in the theories of Euclid and Hilbert is highly relevant for a better understanding of the respective geometrical practices. On the other hand, we will claim that these conceptual relations unveil interesting issues between the two main contemporary approaches to the study of area of plane rectilinear figures, *i.e.*, the geometrical approach consisting in the geometrical theory of equivalence and the metrical approach based on the notion of measure of area. Finally, we will analyze how the different strategies commonly used to provide a proof of De Zolt's postulate raise interesting issues for the current discussions on the purity of method.

From Topology to Combinatorics:

Diagrams and Computers in the Four-Color Theorem Proof

Gisele Dalva Secco

(UFSM, Brasil)

The advent of the use of computers in mathematical practices received definitive philosophical attention at the end of the 1970's, when the proof of the Four-Colour Theorem (4CT) was presented. This publication can be considered as the closure of a mathematical history involving above all topics in topology, graph theory and combinatorics. But it can also be considered as *the* turning point in the relations between mathematics and computer science, especially with respect to the use of computer machinery to establish original mathematical results. It is broadly known that the main reason why the 4CT proof provoked a certain commotion in the mathematical community is the indispensable participation of computers in its construction – it is the passage from one area (topology) to another (combinatorics) that allowed for the introduction of computer in the search and the execution of the proof. In my talk, I'll present the structure and the main ideas of the 4CT proof, the four claims that determined the philosophical discussions about it and the main points of these debates. My main goal is to delineate some questions regarding the interaction between the uses of diagrams and computational devices in the proof of the 4CT. I'll finish suggesting a parallel between the questions related to this study case and some general questions related to the role of diagrams and computers in economics.

The non-logical role of diagrams in proofs

John Mumma

(California State University at San Bernardino, USA)

Mathematical proofs are commonly identified with their logical analyses. Accordingly, we obtain a full and precise account of what a mathematical proof is, essentially, when have resolved it into a list of sentences linked to each other by logically valid inference steps. A consequence of this view, when applied to a well-organized body of mathematical knowledge, is that the way the knowledge is structured into a sequence of theorems loses significance. From a purely logical perspective, a theorem of a mathematical subject is any sentence derivable by logical rules from the axioms of the subject. Thus, in the case of the elementary geometry of Euclid's Elements, logic provides us for no resources for accounting for why its propositions are individuated in the way they are in the text. From a logical perspective, there is nothing requiring us perspective to understand each of Euclid's proofs as establishing a single proposition in a sequence of propositions. We can just as easily understand the proofs as establishing the giant conjunction of all the proposition's in the *Elements*.

In my talk I explain how it is only by understanding the non-logical, diagrammatic character of Euclid's proofs that we can give an account of Euclid's individuation of propositions. I also explore how the concept of mathematical proof can be broadened beyond the logical so that the diagrammatic character of Euclid's proofs becomes essential to them as proofs. The central idea is that a mathematical proof must, along with presenting a sequence of logically linked claims, exhibit how the mathematical structure the claims are about satisfy conditions not explicitly stated as premises. I discuss the role of geometric diagrams in ensuring that the proofs of elementary geometry meet this requirement, and consider whether a similar role can be attributed to diagrams in other areas of mathematics.