

New Jersey Science League PO Box 65 Stewartsville, NJ 08886-0065 www://entnet.com/~personal/njscil/html

Cell # 908-213-8923 New fax # 908-213-9272 email newjsl@ptd.net

To all schools in the State of New Jersey:

September 2018 Updated 11-7-2018

Registration for the New Jersey Science League is now open to all public and private schools in the State. Registration will remain open until the end of December 21, 2018

The Science League is unique in both the State and our Nation. Having been started in 1962 by Dr. Mal Sturchio as a chemistry league, the League now offers competitions in biology, chemistry, physics, Earth science, and environmental science. There are also competitions for AP levels in chemistry, biology, and physics. The topics, rules, and fees of the League as well as a registration can be found at the web address of www./entnet.com/~personal/njscil/html

The purpose of the Science League is to provide competitions between schools in selected science areas of study. All competitions are on two levels. One level is for the students. Students within any one testing area are ranked with each other based upon their scores on 3 of the 4 exams given. Any student completing 3 of the 4 exams receives a certificate from the Science League. The top ten percent (10%) of the students receiving a certificate also receive a student plaque. Last year the League awarded approximately 240 student plaques. The plaques are presented to the students in conjunction with your school's awards program.

The next level of competition is with teams, which represent the schools. The students make up teams from each school. Each school only needs two members for each team, but as many as four students may compete for each subject area. Schools may sign up for one to ten teams. Team scores which is sum of top 2 student scores are cumulative from January through April. Competition within each testing area is extremely keen. By the end of the season there can be as little as one question separating first place from second place. For each competition the results are posted on the web at www://entnet.com/~personal/njscil/html. The final team score for the season will be the sum of all four exams. Schools are ranked from #1 down to the last school. The top 10 schools (not 10%) are awarded plaques. Exceptions are those subject areas having less than 100 schools. Those subject areas will be awarded plaques for the top 10% of the schools in the

subject area.

This year bussing will <u>not</u> be mandatory, but is highly recommended. However, areas may change depending upon the schools that are willing to bus. For those areas with a host school for any one month the exams for the area will be sent to the host school. All areas are encouraged to gather at a host school.

In order to be part of the New Jersey Science League you need to fill out the online registration at www://entnet.com/~personal/njscil/html. You may also scan the online registration and return by email (newjsl@ptd.net). Our new fax # is 908-213-9272. If you have any questions, please call 908-213-8923 or email and the director of the League will get back to you as quickly as possible.

Thank you for your time. We are looking forward to receiving your registration. Sincerely,

Bill Spears, Director of NJSL Vanessa Rainford

PARTICIPATION IN THE NEW JERSEY SCIENCE LEAGUE

All public and private secondary schools in New Jersey are invited to participate in the Science League. Exams will be given in the following area:

First Level (Non-AP) BIOLOGY, CHEMISTRY, HS PHYSICS*, and EARTH SCIENCE.

*High School PHYSICS (HS Phy) is for college prep and honors students who are taking

regular high school physics or physics first, no AP students.

**Schools teaching from the IBO program please send an email to newjsl@ptd.net letting the League know of your situation.

Second Level (or AP) BIOLOGY II, CHEMISTRY II, PHYSICS I(ap I), PHYSICS II(ap II) and PHYSICS C for students **currently enrolled** in an AP level course, second year course, or an independent study program. **ENVIRONMENTAL SCIENCE** is open to all students. At the end of the season college prep and honors students(HS) will be separated from the AP students for ranking and awards. For schools wanting to

Each school will be allowed up to **FOUR STUDENTS**, but no more, on a team per testing category, per examination. A school can have as many as ten teams, if registered for all ten categories. **PARTICIPATION BY STUDENTS MUST BE LIMITED TO ONLY ONE YEAR IN EACH EXAM CATEGORY. DURING A SEASON, STUDENTS MAY TAKE EXAMS IN ONLY ONE AREA.**

Local areas will be established and schools within those areas will meet monthly starting in January at a local host school. Each participating school must provide transportation for its students to and from the host school and assume responsibility for obtaining parental permission, insurance, etc. Bussing is optional.

Examinations will be held after school only at the designated area host schools.

At least one teacher from each school must accompany the participating students to the competition. The teachers assist in proctoring and grading the examinations.

All exams are to be taken at the designated school for the area each month. If inclement weather prevents a whole area from taking an exam, then every effort should be made to retake the exam in the group setting. If an individual school is prevented from taking an exam because of either reason above, the teacher will be responsible for contacting the host school to make arrangements. ALL EXAMS MUST BE TAKEN AND RETURNED TO THE SCIENCE LEAGUE OFFICE WITHIN ONE WEEK OF THE SCHEDULED EXAM DATE IN ORDER TO BE COUNTED. Results will be posted on the web at www://entnet.com/~personal/njscil/html.

FEE CHART PER SCHOOL

Registration fee in the Science League is \$90 per team. Multiple team discounts apply as follows:

# Teams	Teams Cost	Discount	Discounted Team Cost	Total Cost
	2050		Tourn Cost	includes
				shipping \$40
One Team	\$90	None	\$90.00	\$130
Any two teams	\$180	Less 5% discount	\$171.00	\$211.00
Any three teams	\$270	Less 10% discount	\$243.00	\$283.00
Any four teams	\$360	Less 15% discount	\$306.00	\$346.00
Any five teams	\$450	Less 20% discount	\$360.00	\$400.00
Any six teams	\$540	Less 25% discount	\$405.00	\$445.00
Any seven teams	\$630	Less 30% discount	\$441.00	\$481.00
Any eight teams	\$720	Less 35% discount	\$468.00	\$508.00
Any nine teams	\$810	Less 40% discount	\$486.00	\$526.00
All Ten teams	\$900	Less 45% discount	\$495.00	\$535.00

Invoices will be sent out to all schools upon registration. Please make a copy of the registration form for your Board of Education office. Mail to the League Office listed below. Please fill out a requisition form requesting a Purchase Order for the Science League fees. Checks should be made out to: The New Jersey Science League.

TESTING DATES FOR THE NEW JERSEY SCIENCE LEAGUE

Dates for 2019 Season

Thursday January 10, 2019 Thursday February 14, 2019 Thursday March 14, 2019 Thursday April 11, 2019

All schools must complete the April exam and mail in the results by April 30th, 2019

No area may take the April exam during the first week of April or the first week of May

EXAMINATIONS:

Examinations will be prepared under the supervision of the Director of the League. Exams will consist of combinations of multiple choice and completion questions as well as problems. The exams will be designed to require 50 minutes completion time. Where possible the new State standards will be incorporated into the tests.

There will be four New Jersey Science League examinations held on the SECOND THURSDAY of each month at approximately 4 PM or earlier. The first examination will be in January and the last in April. Non-programmable calculators are allowed. No student is allowed to use any calculator that uses Windows OS or Palm OS operating systems. Chemistry and Physics students will be provided formula sheets for the exams. Copies of the formula sheets are on the web at.www://entnet.com/~personal/njscil/html

The exams will be sent to the contact teacher at the host school who will be responsible for storing them, **unopened**, until the first school arrives. Host schools for the first exam are chosen by the League Office, or by schools upon registration.

After each examination, a refreshment break is held for the students, while the teachers grade the exams. The Area Record Sheet will be filled in and returned to the League Office, along with the student scansheets. Please return all scantrons for each team member other than alternates. Team scores will be posted along with the initials of individual student scores.

STUDENT AWARDS: All students who have completed three of the four examinations receive certificates noting their participation. The top 10% of the students in each category will receive a New Jersey Science League plaque. The award winners will be selected by adding the student's highest **three** examination scores. They will be ranked from highest to lowest with ties taking the place of ranks below the tie.

TEAM AWARDS: The ten schools with the best team ranking in each subject category in the State will receive plaques denoting this distinction. The team awards are selected in the following way:

The two highest ranking individual scores from among the student team competing in any given examination will constitute the team score for that exam. The cumulative team rankings will then be determined by adding the team scores from the four exams for each subject. All schools falling within the top 10 of their subject testing area will receive a plaque noting their placement in the top 10. An exception will be any subject area that has less than 100 schools. The the top 10% of those schools will receive a plaque. All schools placing in more than one subject testing area will receive a composite plaque containing their placement in each subject category. If a school wishes to have all individual plaques instead of the composite plaque, then contact the League office for the extra cost. For all teams receiving a team plaque a letter of recognition will be sent to their governing Board recognizing their achievement.

TOPICS OF STUDY FOR THE NJSL 2018-2019 SEASON

BIOLOGY I: No AP or second year students in this category. 60 multiple choice questions per exam.

JANUARY EXAM – Scientific Method, Microscope parts and functions, Carbon Compounds and basic chemistry including the chemistry of water and pH, Chemical Reactions, Enzymes, Cell structure and function, Levels of Cellular Organization, Organelles, Prokaryotic and Eukaryotic, Cell membrane structure and function, Cellular and Intracellular transport, Tonicity, Homeostasis, Cellular Energy Flow, Photosynthesis and Respiration, Cellular Division- Mitosis, Cell Regulation.

FEBRUARY EXAM - Structure and function of nucleic acids, experiments identifying DNA as the hereditary molecule, DNA replication, roles of DNA and RNA, protein synthesis, viral DNA, Meiosis, chromosomal analysis (pedigree, karyotyping), Mendelian genetics, one and two factor crosses, incomplete dominance, codominance, pleiotropy, polygenic inheritance, sex-linked disorders, mutations and causes, human genetic diseases including chromosomal analysis, Variation of Traits, Genetic engineering, Gene regulation and expression, Plus review of the Jan exams.

MARCH EXAM - Evidence for evolution: historical thought/experimental theories of evolution.....

Biogenesis/Abiogenesis, Comparative anatomy and comparative embryology, Fossil record, Hardy Weinberg, Natural Selection, Speciation and its causes, Taxonomy: Cladograms and Phylogenetic Trees, Genetic change in a population, Patterns and causes of Evolution, Coacervate formation, Miller/Urey experiment. Molecular evidence (nucleotide sequence analysis, amino acid sequence analysis), Plus review of the Jan and Feb exams.

APRIL EXAM - Evidence of diversity, Adaptation of organism to the environment, Types of biomes, Limiting factors in Biomes, Population density and dispersal patterns, Carrying capacity of a population, Exponential Growth, Boom-and-bust growth cycles, Interactions of autotrophs and heterotrophs, Flow of energy through an ecosystem, Symbiosis, Food cycles and webs, Cycles of Matter, Ecological succession, Ecosystem models of energy flow, Ecological experimentation and analysis, Factors affecting biodiversity in a population, Human Influence on ecosystems, Plus review of Jan, Feb, and March exams.

BIOLOGY 11 For AP and second year biology students. 50 Multiple Choice

Question topics for each test will include questions which relate to the Big Ideas I –IV listed below taken from the Advanced Placement Curriculum designed by The College Board. Questions will involve science practices such as analysis of data and evidence to support biological principles. All levels of life (molecules through ecosystems) will be explored on each exam. In addition, for each exam the identified content (e.g. osmoregulation) is linked to the excretory system. For example students should be able to answer, how does osmoregulation occur in the nephron in the excretory system.

Big Idea 1: The process of evolution drives diversity and unity of life

Big Idea 2: Biological Systems utilize free energy and molecular building blocks to grow, reproduce, and to maintain dynamic homeostasis

Big Idea 3: Living Systems store, retrieve, transmit and respond to information essential to life processes.

Big Idea 4: Biological Systems interact, and these systems and their interactions possess complex properties.

January Exam: Structure and function of Biological Molecules, Protein Folding, Bonding in Polymers, Enzymes, Coenzymes, Cofactors, Lipid and their Properties, Carbohydrates. Structure and function of Cells, Organelles and subcellular structures. Cell and tissue types, Germ layers and development. Free Energy and Gibbs Reactions, Enthalpy in Biological Systems, Biological Applications to the Laws of Thermodynamics, Endothermic/Exothermic Reactions, Coupled Reactions, Photosynthesis, Cellular Respiration, Endotherm/Exotherm in Body Temperature Regulation, Cell Types, Surface Area/Volume Ratios, Fluid Mosaic Model of the Membrane, Properties of Water, Osmoregulation, Membrane Transport, Cellular Feedback Mechanisms, Metabolic Processes and Metabolism, Communication; signaling, reception, transduction and response.

<u>February Exam:</u> DNA and replication, RNA and Protein Production, RNA Types, Cell Cycle and Controls, Mitosis, Meiosis, Application of Mendel's Laws, Mendelian and NonMendieian Genetics, Genetic Disorders, Cancer, Genetic Engineering Techniques, Nonnuclear Inheritance, Transposons, Crossover, Gene Regulation, Apoptosis, Developmental Genes, Mutations, Biotechnology, Embryonic Development in Plants and Animals, Signaling Mechanisms, Transmission and Transduction Pathways, Polyploidy, Sex Inheritance, Mutation Effects, Viral Replication, Genetic Variation Processes, Mating Types, Behaviors and Parenting, Bacteria and Yeast Reproduction and use in Biotech, Review of Jan topics.

<u>March Exam:</u> Evolution, Natural Selection, Artificial Selection, Mechanisms for Evolution, Hardy Weinberg Principles, Genetic Drift, Gene flow, Evidences for Evolution, Blast Genomic Analysis, Cladogram, Evolutionary Trees, Evolution of the Domains, Adaptive Radiation, Island Biogeography Theory, Speciation, Prezygotic and Postzygotic Mechanisms, Energy in Reproductive Strategies Hypothesis on Origins of Life, Virus and Bacteria types and adaptations. Evolution of systems in plants and animals. Review of Jan and Feb topics.

April Exam: Ecosystem Energy Pyramid Structure, Food Web Alterations, Organ and System Specialization, Interactions and Coordination in Plants and Animals, Organism Responses Adaptation to Environment, Ecosystem Transformations, Components of a community, Transpiration, Population: Variation, Growth, Dynamics and Distribution, Exponential and Logistic Population Growth Models, Population Density, Limiting Factors, Species Richness, Species Diversity, Competition, Bacteria, Fungi, Symbiotic Relationships, Food Webs, Productivity, Energy Dynamics, Keystone species, Exotic and Alien Species Biogeochemical Cycles, Energy of Reproductive Strategies, Behavioral and Physiological Response to Environmental Stress, Taxis and Kinesis, Tropisms, Biological Rhythms, Behavioral Biology. Review of Jan, Feb, and March topics.

<u>CHEMISTRY 1</u> For Honor's, Enriched or College Prep. Not for AP or Second year. 25 multiple choice questions.

<u>January Test</u>: scientific method, measurement, factor label conversions, properties, graphing, mixtures, compounds, formulas, mole, weight percent, chemical reactions, using the metal and non-metal activity series for writing chemical reactions, types of reactions, stoichiometry, atomic structure and history which includes alpha, beta, gamma radiation, but not electronic configuration.

<u>February Test</u>: Quantum Theory, Electronic structure, orbital notation, dot notation, Coulomb's Law, periodic behavior, specific heat, heat of phase changes, molar heat of fusion, molar heat of vaporization, graphs of phase changes, plus January topics.

<u>March Test</u>: Chemical bonding, molecular structure, simple isomers, intermolecular attractions, redox but not balancing redox equations, kinetic theory, solids, liquids, gases, gas laws, gas Stoichiometry, mole fraction as applied to gases, plus January and February topics.

<u>April Test</u>: solutions, use of solubility rules, reaction rates, chemical equilibrium, entropy, reaction spontaneity, Keq, acids, bases, salts, net ionic equations, thermo chemistry, ΔH , Hess's law, radioactive decay reactions, plus January, February, and March topics.

CHEMISTRY 11 For all second year and AP level students. 25 multiple choice questions per exam.

JANUARY: matter and measurement, atomic theory (sub-atomic particles, atomic masses), spectroscopy (Beer's Law), Mass Spectroscopy graphs of elements (not compounds), chemical formulas, chemical equations (precipitation reactions, ionic equations, solubility, acid-base reactions, gas forming reactions, oxidation reduction reactions, balancing redox reactions by oxidation state method, activity series, mole relationships, mass-mass problems, stoichiometry of redox solutions, solutions stoichiometry, light, photoelectron effect, emission and absorption spectra, electronic structure and periodic table/periodicity.

FEBRUARY: chemical bonding, bond order (no molecular orbital theory), doping and semiconductors, paramagnetism, and diamagnetism, electronegativity, Lewis structures, molecular geometry, polarity of molecules, hybridization(sp, sp², sp³), intermolecular forces (van der Waals forces, relations between boiling point and vapor pressure), thermo chemistry (enthalpy, Hess's Law, heats of formation, bond energies, calorimetry), phase changes (not PT diagrams), gases and gas laws, plus January topics.

MARCH: non-metals, metals (not unit cells), solutions, energetics of solution formation, kinetics, reaction mechanisms, descriptive chemistry of the elements, plus Jan and Feb topics.

APRIL: chemical equilibrium, acids, bases, and salts (hydrolysis), pH, K_a , K_b , buffers, titration curves, solution equilibria, redox, voltaic cells, electrochemistry, thermodynamics (ΔS , ΔH , and ΔG), descriptive chemistry of the elements, plus Jan, Feb., and Mar topics.

EARTH SCIENCE 72 multiple choice questions per exam.

Geology: Approximately 44 questions: minerals, rocks, structure, tectonics, fault/folding, volcanisms, glaciation, rivers ground water, ocean shore, weathering, historical, maps, projections/lat./long./time, **Astronomy**: Approximately 14 questions: sun, moon, earth/moon/sun system, planets, stars, galaxies, cosmology.

Meteorology: Approximately14 questions: temp/air masses, pressure/highs/lows, moisture in atmosphere, weather fronts, weather maps.

Environmental Science If you wish to have a HS Environmental Science Team and an AP Environmental Science Team please send an email to newjsl@ptd.net or call 908-213-8923

65 multiple choice questions per exam. Open to all students.

JANUARY TEST: Science: methods, evidence, correlations, statistics, models, graphing & interpreting graphs. Earth systems (ex: atmosphere, geosphere, hydrosphere) & dynamics (ex: plate tectonics, earthquakes, glaciers, volcanism) plus biogeochemical cycles, solar intensity & latitude Energy –Flow from sun to trophic levels, Ecosystem Structure - Biological populations, distribution, ecological niches; species interaction; keystone species; species diversity, major biomes. Selection: adaptations, natural, artificial, & selection pressures,

FEBRUARY TEST- Human Population Dynamics: Demographic transition, distribution; growth rates, doubling times; age-structure diagrams, density, carrying capacity; reproductive strategies; survivorship. Succession – primary, secondary, old field. Soil & Soil Dynamics – structure, types, erosion, depletion of nutrients, biogeochemical cycles, fertilizer, soil triangle. Land Use– Farm methods - traditional & sustainable; genetic engineering, deforestation; irrigation; pest control methods, overgrazing; deforestation; desertification; salinization, urbanization, and soil conservation techniques. Pollution and Health issues related to the environment. Plus any Jan Topics

MARCH TEST: Water Resources, Use, Pollution –zones, freshwater/saltwater concepts; eutrophication process, surface & groundwater issues, irrigation, tidal impact; coral reefs, salt marshes—Waste-Wastewater treatment process, point & non-point pollution, water's role in bioaccumulation, aquatic food webs, environmental degradation, health issues & water related diseases, electronic waste, plastic wastes-gyres.

Mining, Fishing, Biodiversity: extinction, loss, habitat destruction, laws. January & February Topics.

APRIL TEST: Stratospheric Ozone - Air Pollution – Sources, primary & secondary; major air pollutants; heat islands, indoor air pollution; remediation and reduction strategies Climate Change - Greenhouse gases & effect; impacts & consequences of global warming; Energy – traditional and renewable forms, advantages & disadvantages; power; conversions; safety issues; radiation & health; radioactive wastes. Plus Jan, Feb, and March topics

High School PHYSICS For all Honors and college prep students who are taking regular high school physics or physics first. (No AP[®] level students). 25 multiple choice questions per exam.

JANUARY: scalars, vectors, kinematics, projectiles, mass, Newton's laws, forces (mechanical, gravitational, frictional, centripetal),

FEBRUARY: impulse, linear momentum and its conservation, elastic and inelastic collisions, work, potential and kinetic energy and its conservation of energy, power. simple harmonic motion of simple pendulum and mass-spring systems, plus January Topics

MARCH: electrical charges, fields and force, coulombs law, voltage sources and resistances, series/parallel networks, magnetism, plus January and February Topics.

APRIL: Wave propagation, standing waves, sound, optics: light, index of refraction, color, lenses, mirrors, interference phenomena, plus January, February, and March Topics.

<u>PHYSICS I</u> (not physics first) for all students currently enrolled in AP physics I. 25 multiple choice questions per exam.

January Exam: Kinematic, Dynamics, work, energy, and conservation of energy

February Exam: impulse and linear momentum and conservation of linear momentum:

collisions, Simple harmonic motion: simple pendulum and mass-spring systems, Plus review of Jan topics

March Exam: Circular motion and universal gravitation, Rotational dynamics: torque,

rotational kinematics and energy, rotational dynamics and conservation of angular momentum,

Plus review of Jan and Feb topics

April Exam: electrostatics: electric charge and electric force, DC circuits (resistors only) Mechanical waves and sound, Plus review of Jan, Feb, and March topics.

<u>PHYSICS II</u>: for all students currently enrolled in AP physics II. 25 multiple choice questions per exam.
<u>January</u>: Fluid Statics and Dynamics; Heat & Thermodynamics: laws of thermodynamics, ideal gases, and kinetic theory, PV diagrams,

<u>February:</u> Electrostatics: electric force, fields, & potential, DC Circuits and RC Circuits, plus January Topics <u>March:</u> Magnetics and Electromagnetic induction, Geometric & Physical optics, plus Jan and Feb Topics <u>April:</u> Quantum physics, atomic and nuclear physics, plus Jan, Feb and March topics.

PHYSICS C: For all students currently enrolled in Physics C. 25 multiple choice questions per exam.

JANUARY: kinematics in one and two dimensions; Newton's laws including resistance forces and dynamics of circular motion; vector algebra (mostly assumed as needed); energy and its conservation including potential energy and conservative forces, momentum and its conservation including two-dimensional situations

<u>FEBRUARY</u>: angular mechanics including rotational equilibrium, rotational dynamics, rotational energy, and angular momentum; oscillatory motion including kinematics, dynamics, energy, and damping; gravitation including kinematics and dynamics of planetary motion, angular momentum, and energy as applied to gravitation. Plus Jan topics

<u>MARCH</u>: electrostatics including electrostatic forces, electrostatic field, electrostatic field flux and Gauss's Law; electrostatic potential and potential energy; dc electrical circuits including multi-loop circuits and power; capacitors, dielectrics, and circuits with capacitors. Plus Jan and Feb topics

<u>APRIL</u>: Magnetic Fields and Forces including the applications of the Lorenz force, the Law of Biot-Savart, Ampere's Law, magnetic field flux and Faraday's Law, Lenz's Law for electromagnetic induction; magnetic materials, applications of electromagnetic induction, and circuits with inductors. Plus Jan, Feb, and March topics

REGISTRATION FORM 2019 SEASON NJSL

	YOUR NAME (CONTACT PERSON)		School Telephone #		Contact Ext #			
	SCHOOL NAME AND ADDRESS, CITY, STTE, AND ZIPCODE (NO PO BOX #s)							
Conta	ct email address		second email					
Your Supervisor's Name			Ext	email				
Your Principal's Name			email address					
	-	nergency use only						
	СНЕ	CK ($$) WHICH TEA ne of the teacher who	MS YOU WILL BE I	ENTERING.	r email address.			
Check(√) f selected	Team	Coac	ch	Coach Email address				
	Biology I							
	Chemistry I	-						
	HS Physics honors and CP	5						
	Earth Science							
Ţ	Inder the column for	"level" indicate if the	students are from col	lege nren har	ors or AP class			
heck($$)	Team	Level HS or AP	Coach	iege prep, noi	Coach Email address			
	Environmental							
	Science							
	Second v	ear and AP level t	eams sion un in th	e snaces be	low.			
heck(√)	Team	Coach		_	Email address			
meen(1)	Biology II							
	Chemistry II							
	AP Physics I							
	AP Physics II							
	AP Physics C							
Num	ber of Teams:							
Regis	stration Fee: page	2 last column in b	old. \$.00				
		EGISTRATION SHEET						
		ot, then you may email	l to <u>newjsl@ptd.net</u> or	fax to 908-21	13-9272 or scan.			
	use the online registr	th the dates below. Wil	ll vour school be alosed	on any of the	holow dates?			
		late your school will be		i on any or the	below dates:			
	=	bussing? Circle						
2000	•	l host an exam? C	•	yes, circle	date below which			
work	s best for your sch		•					
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No area may take the April exam during the first week of April or the first week of May

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