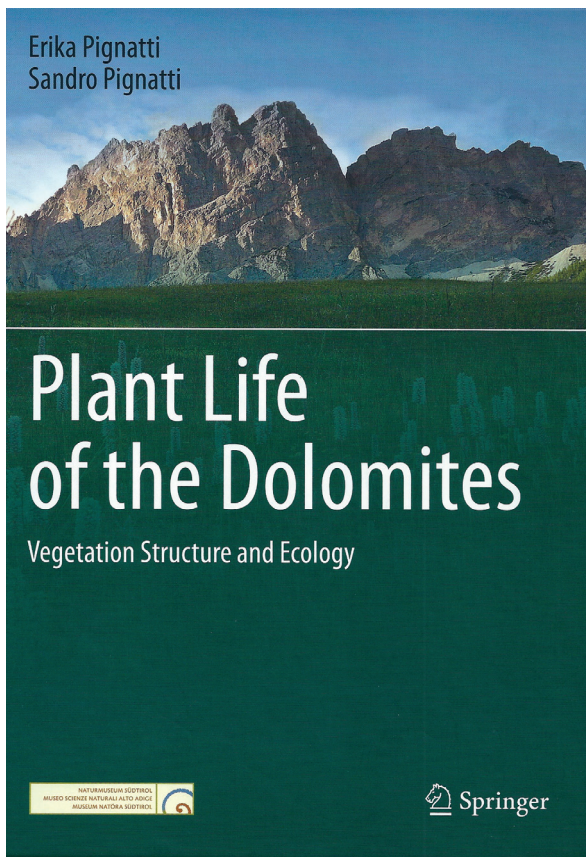


Erika Pignatti, Sandro Pignatti
Rastlinski svet Dolomitov



Kompleksnost, je pojem, ki v celoti prežema zajetno knjigo “Plant Life of the Dolomites”, delo Erike in Sandra Pignatti. Kompleksna je vsebina, kompleksen je pristop, kompleksni sta metodologija in njen razvoj, kompleksni so zaključki. Vseeno pa se tema odvija z jasno analizo in bogato vsebino, podprta s številnimi podatki, na katerih sloni celotna znanstvena osnova. Zametek dela sega v leto 1960, izšlo pa je leta 2014. Delo je torej sad štiriinpetdesetletnega raziskovanja in razglabljanja z namenom, da bi opisali in razumeli rastlinsko odejo Dolomitov, gorskega sveta, ki slovi po edinstveni lepoti. Enkratnost dela je v prepletanju naravnih in krajinskih danosti, zgodovinskih in umetniških pričevanj, ljudskega izročila, človeških dejavnosti in usod, ki jih čuva gorsko območje.

Knjiga se sicer predstavlja kot oris idealnega vzpona na Dolomite. Strokovnim vsebinam, ki

jih knjiga prinaša, stojijo ob strani tudi doživeti pogledi na svet in kulturo domačinov. Številne pojme, ki jih avtorja osvetljuje, bi lahko razširili tudi na druge predele Alp, in tako imenovani “*Monti Pallidi*” predstavljajo priložnost za obravnavo tudi pomembnejših tem.

Pripovedna pot, ki je izrazito ekološko zaznamovana, se začeneja pri vaskularni flori. Slednja je tu prisotna s približno 2300 vrstami, kar predstavlja 1/5 celotne evropske flore; nato zajame rastlinske združbe (opisanih je 106 *fitocenoz*) in *habitate* ter se končno povzpne na najvišji in najbolj celostni nivo, na krajino v njeni celovitosti (ekosistem).

Knjiga je razdeljena na poglobljeno uvodno poglavje, ki mu sledi šest poglavij, posvečenih enakemu številu *habitatov*. Slednji si sledijo po kriteriju višinske razširjenosti (antropogeni *habitati*, nižinski in gorski gozdovi ter travniki, subalpski gozdovi iglavcev, alpska travnišča na kislilni podlagi, na dolomitu in na apnencih, vegetacija melišč, skal in snežnih dolinic). Sedmo poglavje predstavlja sintezo in razlago podatkov. Zadnje poglavje obsega razčlenjen niz zaključkov.

Vsako izmed šestih poglavij predstavlja najprej splošen vpogled v vsebine: ta sloni na ekogramu, na analitični sliki in sinoptični tabeli posameznih rastlinskih združb. Ekogram predstavlja razširjenost posameznih rastlinskih združb na ekološki podlagi glede na klimatske razmere in nadmorsko višino s pomočjo pregledne slike, ki dovoljuje neposredno primerjavo z razmerami, opisanimi v drugih poglavjih knjige. Analitična slika (dendrogram) nudi možnost, da na prvi pogled razberemo razčlenjenost rastlinskih združb obravnavanega *habitata*. Dendrogram sestavlja neprekinjena serija razvejitev; od prvih dvanajstih, ki se nanašajo na antropogeno okolje, se počasi širi *habitat* za *habitatom*, dokler ne zajame vseh 106 obravnavanih rastlinskih združb. Vrsta različnih dejavnikov - fiziognomskih, geoloških (geološka podlaga), bioloških (življenjske oblike rastlin), geografskih (nadmorska višina) - nas v teh shemah z lahkoto privede do iskane rastlinske združbe. Sinoptična tabela omogoča primerjavo med floristično in strukturno sestavo različnih rastlinskih združb.

Vsaka obravnavana rastlinska združba je opisana v posebni preglednici, ki zajema številne odstavke, v katerih so utemeljene glavne značilnosti, vezane na *habitat*: geologija, življenjska oblika rastlin, kemijsko-fizikalni parametri, značilne rastlinske vrste, biološki parametri, infracenološka razčlenitev, deželna in splošna razširjenost, taksonomske in sintaksonomske opombe, izvor in razvojna usmerjenost, stopnja ogroženosti in posledična nevarnost izgube krajinske in kulturne dediščine, ohranjanje in upravljanje. Opis je tekoč in omogoča lahko primerjavo med rastlinskimi združbami, istočasno tudi pripovedna nit med različnimi deli razprave teče gladko in neprekinjeno.

Čeprav je vsak poglavje zaključena enota, predstavlja hkrati enega od korakov v celostnem pretoku informacij (npr. vodoravna črta predstavlja primerjavo med rastlinskimi združbami ali ekogrami, navpičnica pa iskanje povezav s kompleksnejšimi stopnjami).

Stalno je navezovanje na prisotnost človeka, ki je harmonično oblikoval okolje. Avtorja pogosto poudarjata pomen kulturne dediščine, ki se je prenašala iz generacije v generacijo. Slednja je dosegla svoj višek v arhitekturi stalnih, pa tudi sezonskih bivališč, ki so vezana na kmetijsko-gozdno-pašne dejavnosti: od najpreprostejših del (suhi zid) do kompleksnejših, kot so pričevanja evritmične vključitve človeka in njegovih dejavnosti v okolje. V tem smislu so zgovorna opazovanja, ki povezujejo znanstveni vidik (sezonska razrast sviščevcev (*Gentianella*) ali smetlik (*Euphrasia*); razvoj pašniških tal) s človekovimi posegi (košnja, krmljenje živine, proizvodnja hlevskega gnoja, gnojenje, rodovitnost trajnih travnikov).

Vstavljene posebne teme so prikazane na sivem ozadju, kar bralca še posebej pritegne k branju. Kot primer naj navedemo »Japonski gozd« v Dolini Pegolera. Prikazana je povezava med vzroki, ki so v davni preteklosti povzročili nastanek danes primerljivih pojavov na tako različnih področjih, kot so Dolomiti in Japonska. Ena izmed temeljnih postavk tega dela je iskanje vzrokov, ki so oblikovali okolje, kot ga poznamo danes.

Obdelava mogočnega mozaika podatkov se preliva v razčlenjeno sintezo, katere osnovne teme obravnavajo odnose med vegetacijo in celo vrsto drugih elementov, kot so na primer bioklima in kemijsko-fizikalni dejavniki. Zdi se nam, da je treba med najbolj zanimivimi vidiki izpostaviti predloženi novi model razlage odnosov med klimatsko raznovrstnostjo in njenimi učinki, ki jih izražajo živi organizmi v obliki energetske-

ga pretoka. Model izhaja iz znane teze, da se z nadmorsko višino temperatura znižuje. Vendar avtorja poudarjata, da take predpostavke ne moremo linearno prenesti na vegetacijo; slednja, v nasprotju s fizikalnimi dejavniki, ki se kontinuirano spreminjajo, kaže očitno diskontinuiteto. Ta se posebno razločno kaže na primer ob prehodu listnatega in iglastega gozda ali med slednjim in grmišči, pa še med grmišči in gorskimi travniki. To pomeni, da je model uporaben za uvajanje ideje »scenarija«, ki ga pojmuje kot kraj, kjer so različne vrste vegetacije rezultat prekoračenja mejnih vrednosti fizikalno-kemijskih dejavnikov: kovačnica pokrajine.

Študij energetskega pretoka s pomočjo fizikalnih metod vodi do prvega nivoja znanja, ki omogoča njegovo interpretacijo kot dosleden in determinističen proces. Vnos živih organizmov (rastlinskih ali živalskih vrst in skupnosti) opozarja na diskontinuiteto in mnogovrstnost komponent, povezanih z mehanizmi, ki nudijo povratni odziv. Vegetacija je del kompleksnega sistema, ki vztraja v stanju neravnovesja, kljub temu, da uporablja sončno energijo za pogon avtoorganizacijskih procesov. Rastlinske združbe nastajajo z delovanjem splošnih zunanjih dejavnikov, kot sta sončevo sevanje ali kemijska zgradba substrakta, neodvisnih začetnih pogojev, iz katerih se razvije evlucijski proces rastlinske odeje. Ko se slednja vzpostavi, razvije vrsto novih značilnosti (neodvisne spremenljivke), kot so homeostaza, odpornost in prilagoditvena sposobnost, ki označujejo višji organizacijski nivo.

S tem so postavljeni temelji za razlago, ki presega rastlinske združbe, usmerja se v preučevanje okoljskih sistemov oziroma kompleksnosti raznolike vegetacije na različnih območjih Dolomitov.

Najbolj izstopa zadnje poglavje, ki dosega najvišjo kompleksnost, po kateri lahko stremi preučevanje vegetacije. V njem se izkoristijo vsi prehojeni koraki, ki privedejo do zaključne sinteze, do nove paradigme, ta pa predstavlja, po besedah avtorjev, primer pristopa h kompleksnosti.

Lahko skratka zaključimo, da avtorja v delu prikazujeta območje preko skupine informacij, ki se vrstijo kot tema za temo, da se na koncu nadgradijo v humanistično (ekološko-kulturno) vizijo Dolomitov, ki predstavljajo biološko in kulturno dediščino, pripadajočo celotnemu človeštvu, a ji v času stalno pretijo različne grožnje.

Sliko današnjega stanja nam v tem smislu izostrimo med zaključne strani vključena razpredelnica. Če se zaustavimo samo pri rastlinskih združbah,

kar osemnajstim (17% celote) preti nevarnost takojšnjega izginotja!

Čeprav predstavlja delo *summo* sedanjega vedenja o krajini Dolomitov, je še vedno, kot poudarjata sama avtorja v zaključku, veliko prostora za nova spoznanja. Tako kot zaključek nekega poglavja nakazuje začetek novega, tako tudi pridobljena znanstvena dognanja predstavljajo istočasno cilj in odskočno desko za korak naprej.

Fabrizio Martini, Marina Pertot

Erika Pignatti, Sandro Pignatti **Plant life of the Dolomite**

Complexity – this is the concept that permeates *Plant Life of the Dolomites*, the mighty endeavour of Erika and Sandro Pignatti: the topic is complex, the approach is complex, the methodology and development are complex, and the conclusions are complex. Despite this, the discussion unfolds with clarity in its analysis and richness in its content, beginning from the impressive amount of data on which the whole of its scientific edifice rests. Started in 1960 and published in 2014, the work is the result of 54 years of research and reflection on how to describe and interpret the botanical landscape of the Dolomites, that mountainous area preeminent amongst many, famous for its incomparable beauty and unique for the naturalistic content, landscapes, historical and artistic memories, traditions, activities and human vicissitudes it is custodian of.

The scientific content of this book – which is written as if compendium to an ideal excursion up the Dolomites – is flanked by glances into the world and culture of the people living on these mountains. However, many of the concepts discussed are extendable to other parts of the Alps, so much so that the “Pale Mountains” become an opportunity to deal with more far-reaching issues.

The narrative journey, which is marked by a profound ecological footprint, starts from a description of the vascular flora – the area’s primary component, comprising about 2,300 species, that is to say more than 1/5 of the flora of the whole of Europe – goes on to define 106 plant communities (phytocoenoses) and their habitats, and finally arrives at the highest and most comprehensive level of understanding of the botanical phenomenon – the ecosystem of the landscape.

In addition to a detailed introductory chapter, the book includes sections dedicated to six habitats described in order of altitude. These are: the anthropogenic habitats; the forests and meadows of the valley floor and mountain; subalpine coniferous forests; the alpine grasslands on acid, dolostone and limestone substrates; and finally the vegetation of screes, cliffs and snow-beds. A synopsis and interpretation of the data is given in the seventh section, whereas the final part of the book develops a comprehensive set of conclusions.

Each of its six descriptive sections is introduced by an overview of its content aided with the use of ecograms, analytical frameworks and synoptic tables of plant communities. The ecograms give the distributions of the ecological associations in relation to climate and altitude; the easily interpretable diagrams allow immediate comparisons to be made between the various habitats described in the book. The analytical frameworks (dendrograms) allow the reader to grasp at a glance the diversity expressed by the plant communities; they consist of a continuous series of ramifications that, starting from the first 12 relating to the anthropogenic environments, extend to all 106 phytocoenoses reported. In these charts, the interaction of physiognomical, geological (type of substrate), biological (plant forms) and geographical (altitude) characteristics permits easy understanding of the botanical associations. Finally, the tables allow comparisons to be made between the botanical and structural compositions of the different plant communities.

Each of the 106 phytocoenoses described are characterised on the basis of their main features relating to habitat, geology, structure, physicochemistry, botanical composition, biology, infra-coenotic articulation, regional and general distribution, taxonomy and syntaxonomy, origin and dynamic trend, conservation status, risk of loss of natural and cultural heritage, conservation, and management.

The information is handled smoothly, allowing easy comparisons to be made between the plant communities but at the same time maintaining an effortless and continuous thread between the different parts of the discussion. Although each section or chapter is independent, they form a uninterrupted flow of information that is, for example, horizontal for comparisons between plant communities or ecograms, and vertical for connections with superior levels complexity.

Reference to the presence of humans – which have harmoniously shaped the landscape – is continual. The authors frequently stress the importance of the cultural heritage that has been passed on from generation to generation and sublimated in the architecture of the permanent dwellings and seasonal structures linked to the agro-silvo-pastoral activities, from the simplest artefacts (e.g., drywalls) to more complex ones, all of which attest the eurhythmic insertion of man and his activities into the environment. In this sense, the observations linking scientific aspects (e.g., seasonal habitus of *Gentianella* or *Euphrasia*; evolution of pastoral soils) with anthropological ones (e.g., haymaking; feeding of livestock; production of manure; application of fertiliser; production quality of the meadows) are eloquent.

Issues that deserve particular attention are highlighted by grey boxes. These include a discussion on the hypothesis given in “*Foresta giapponese*” by V. Pegolera, which suggests a link between the underlying causes of the comparable outcomes in geographical areas as diverse as the Dolomites and Japan. The search for the primary determinants of current conditions is a key point of discussion in the book, and aims to tie the appearance of the landscapes to reasons that generated them.

The processing of the impressive mosaic of accumulated data is comprehensively summarized in a number of significant points of the relationships between types of vegetation and on a variety of elements such as the bioclimate and physicochemical factors. Amongst the most interesting issues, we call attention to a new model for the assessment of the relationship between the climate and its products, expressed by living systems, in terms of energy flow. The model takes its cue from a well-known assumption: the decrease in temperature as a function of increasing altitude. But, as the authors point out, this assumption cannot be transferred linearly to vegetation, which, in contrast to physical factors that vary in a continuous way, shows clear discontinuity. This is particularly evident, for example, in the transition between deciduous and coniferous forests, or between the latter and alpine shrubland or grassland. Thus, the model is used to introduce the concept of the “scenario”, intended as an area in which the different types of vegetation are the result of exceeding thresholds of physicochemical factors – the forges of the landscape.

The study of energy flow with physical methods leads to an initial level of understanding of the phenomenon as a coherent and deterministic process. However, the inclusion of living beings (i.e., species and communities of plants and animals) reveals the discontinuity and multiplicity of the components associated with the feedback mechanisms. The vegetation is thus part of a complex system that persists in a state of non-equilibrium and that uses solar energy to activate self-organizational processes. This leads us to the concept of phytocoenosis through an understanding of the action of general, external factors, such as solar radiation or the chemical makeup of the substrate: the vegetation layer evolves from these initially independent factors, and once established, generates a series of new (independently variable) qualities that characterise a higher organizational level, such as homeostasis, resilience and adaptative capacity.

Thus, the foundation is laid to propel the discussion beyond plant communities to the study of landscape systems, i.e., the vegetation complexes of the different areas of the Dolomites. This final level is the highest and most intricate that botany can aim for. It leverages all of the previous steps to arrive at its conclusive synthesis, a new paradigm – in the words of the authors – that constitutes an example of the approach to complexity.

At this point it remains only to draw the final conclusions, which the authors present as a concentration of information flowing from argument to argument, finally condensing in a humanistic vision (cultural ecology) of the Dolomites as a biological and cultural heritage that belongs to the whole of humanity and that is endangered by all kinds of threats. In this sense, the table included in the final pages brings the current state of affairs sharply into focus: only from the phytocoenotic point of view, as many as 18 plant associations (17% of the total) are at an immediate risk of extinction!

As the authors highlight in the epilogue, although the book is a compendium of the current awareness on the Dolomites, there is definitely room for the acquisition of new understanding: similarly to the end of one chapter foreshadowing the beginning of the next, so does acquired scientific knowledge represent both a point of arrival and a springboard for further leaps forward.

Fabrizio Martini, Marina Pertot